Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS

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MEMBER A. B. C. *The Largest Paid Circulation Covering The Rock Products Industry* MEMBER A. B. P.

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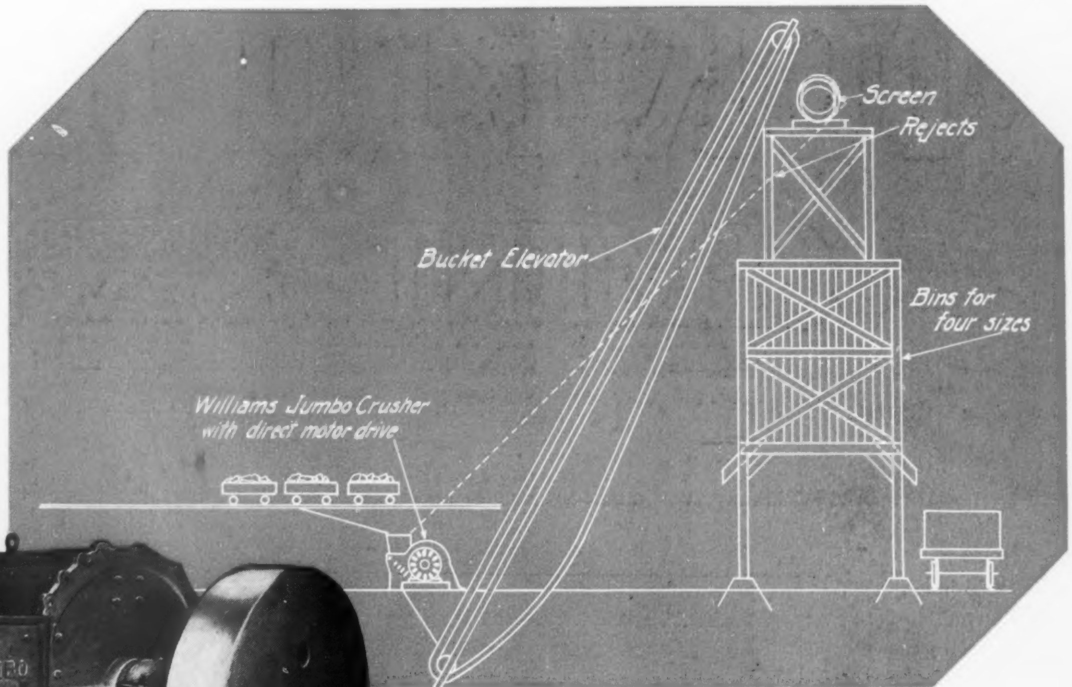
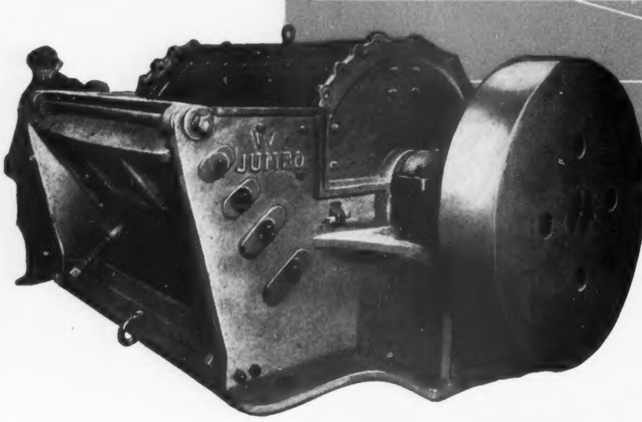
To the right, plant layout of the Big Creek Stone Co. Note the one Williams does all the crushing.



Below, Williams Jumbo Crusher as used.



Big Creek Stone Co.

says:

"Our Williams Crusher, the best piece of machinery in the plant"

No wonder this enterprising crushed rock and agstone producer of Marshall, Ill., likes the Williams Hammer Crusher. Mr. C. G. Evans, Plant Manager, in a recent interview, reports its following accomplishments:

One crusher does all the crushing, simplifying operations, lessening labor and attention, cutting building requirements and plant investment 50% to 75% and reducing crushing costs.

Handles 24" to 36" limestone and reduces to agstone at the rate of 30 tons per hour. Or crushes 100 tons per hour when set to make 1¼".

Low up-keep expense. Crusher hammers after 15,000 tons service showed no apparent wear, indicating probable hammer life of several hundred thousand tons before renewal.

Williams installations in every vicinity. Let us tell you about one nearby, also about a Williams for your work. Capacities 10 to 300 tons per hour and in sizes to handle spalls to 48" cube stone.

Here is the size rock handled by the Jumbo.

Williams Patent Crusher & Pulverizer Company
800 St. Louis Ave., St. Louis, Mo.

Chicago 37 W. Van Buren St. | New York 15 Park Row | San Francisco 337 Rialto Bldg.

THE WILLIAMS PATENT CRUSHER & PULVERIZER CO. ST. LOUIS, MO. U.S.A. TRADE MARK

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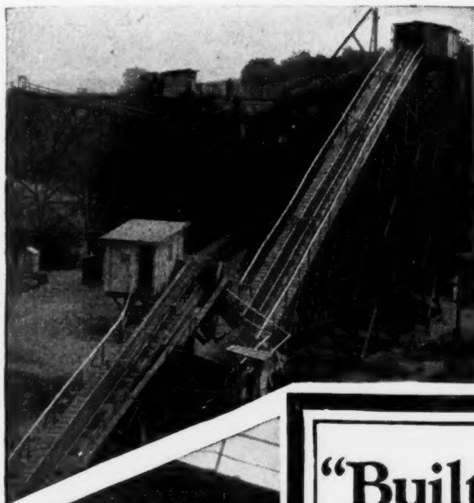
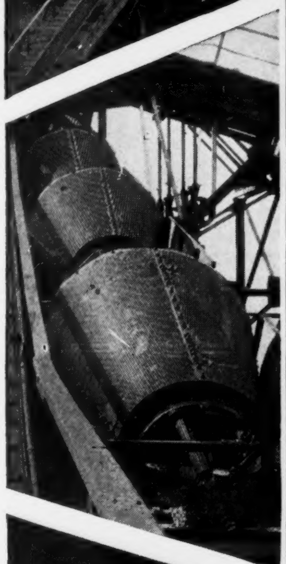
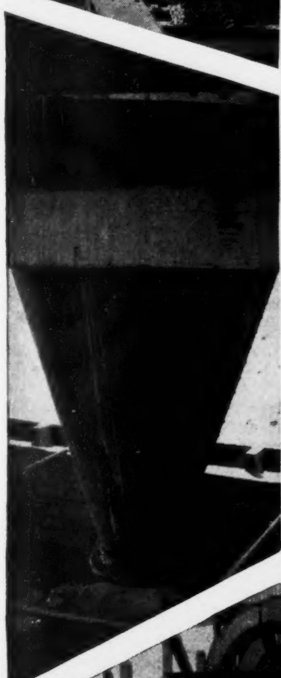
Williams

OLDEST AND LARGEST BUILDERS OF HAMMERMILLS IN THE WORLD

PATENT CRUSHERS GRINDERS SHREDDERS



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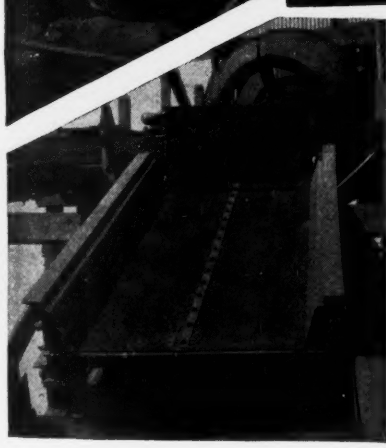


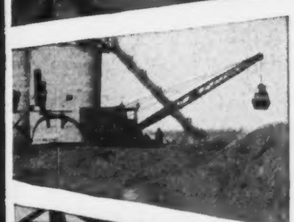


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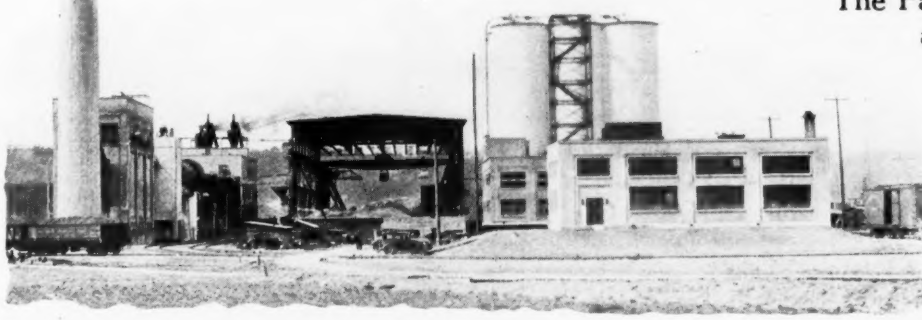
Outstanding Portland Cement Plant

The Pacific Coast Cement Co. Plant at Seattle, Washington*

By S. E. Hutton

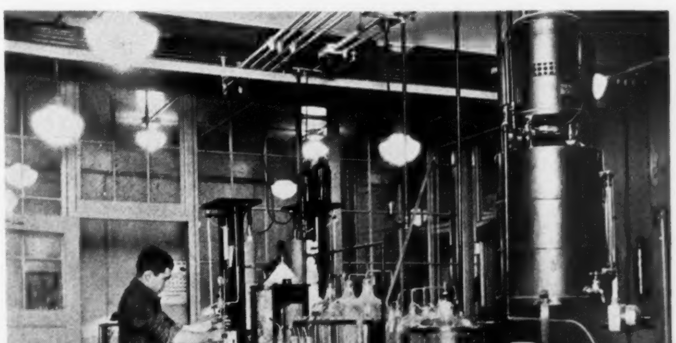
Research Engineer, Pacific Coast Cement Co., Seattle, Wash.



The latest cement mill on the Pacific Coast—Seattle, Wash., plant, Pacific Coast Cement Co.

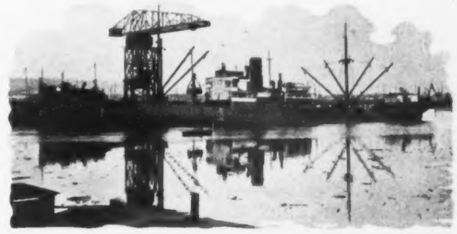
FOLLOWING five years of investigation, planning and construction by the Pacific Coast Co., its latest subsidiary, the Pacific Coast Cement Co., started operating its 1,250,000-bbl. plant on tidewater in Seattle, in January, and the marketing of "Diamond" brand cement began in February.

The plant occupies a large part of a 19-acre tract on East Waterway, four miles from the business center of the city. It is characterized by the simplicity of its arrangement, by the large size and the small number of its pieces of equipment, by its unrestricted facilities for enlargement and improvement and by the ease and precision of control made possible in it by raw materials of exceptional uniformity of composition. It is adapted to the production of either normal portland cement or high-early strength cement at low cost.



A corner of the well-appointed testing laboratory

The layout provides for four kilns, 11 ft. 3 in. by 240 ft., three raw mills, 7 by 45 ft. and three finishing mills of the same size. There have been installed two kilns and three mills, one grinding raw materials, one grinding clinker and one arranged to serve as either raw mill or finish mill, as may be necessary. Either larger or smaller units can be installed in the future. The present silo capacity is 90,000 bbl., and space is available for increasing it to any reasonable limit. The rock storage capacity of 100,000 tons is sufficient for the fully developed plant, as is also the clinker storage capacity of 150,000 bbl.



The S. S. "Diamond Cement" discharging limestone

Raw materials can be received, and cement can be shipped by water, by truck or by any one of five railroads.

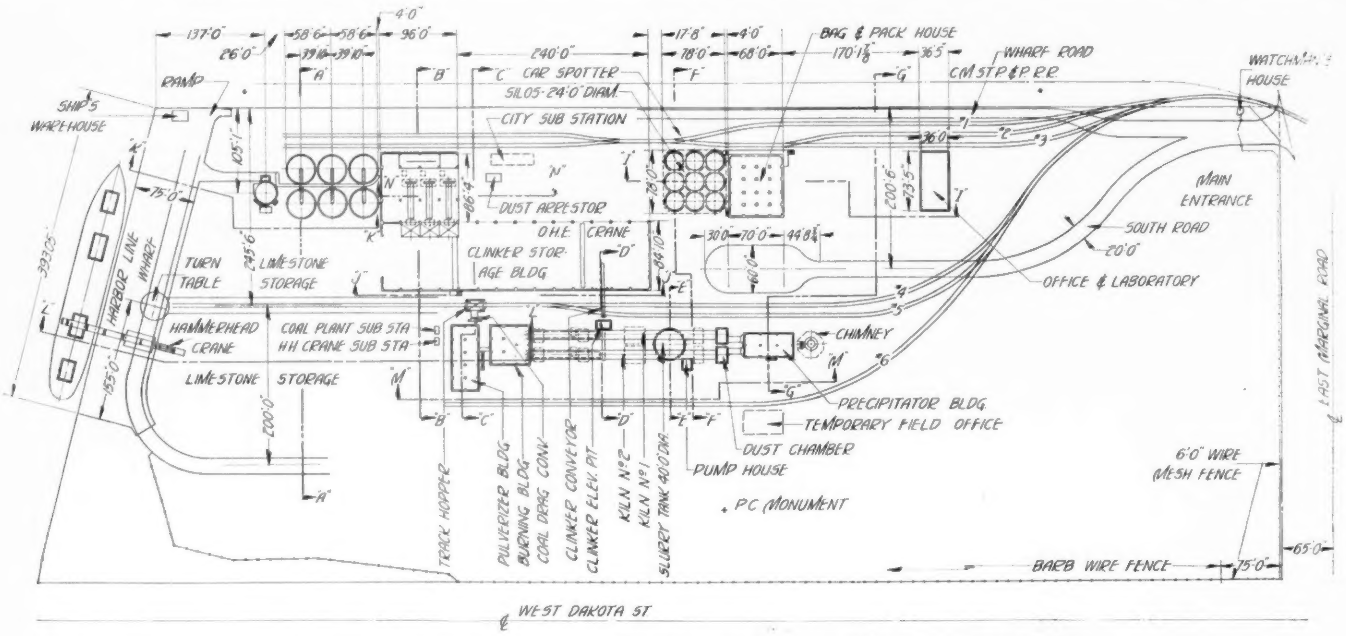
Raw Materials—Limestone

Limestone for the plant, crushed to 1-in. ring size and finer, is brought from the company's quarry on Dall Island, southeast Alaska, in cargoes of about 6300 tons. The quarry site was selected after thorough examinations (involving surveying, sampling, tunneling and drilling, as conditions justified) had been made of all known limestone deposits in Western Washington, and of

*Photos by Boris Kviatkovsky, draftsman, Pacific Coast Engineering Co., Seattle, Wash.

many deposits in British Columbia and in southeast Alaska.

The limestone is remarkably uniform in quality and, with a considerable admixture of top soil, averages 94.5% calcium carbonate. The company's deposit contains



Ground plan showing locations of principal buildings and equipment

more than 20,000,000 cu. yd. of rock, most of which runs above 97.5% calcium carbonate.

Clay

The argillaceous component of the cement slurry is derived from one of the glacial clay deposits which are so numerous in the Puget Sound district but which, contrary to general opinion, vary widely in their chemical and physical properties when considered technically.

Preliminary investigations included the examination of numerous deposits of glacial clay, and shale from the coal measures for the purpose of comparing their values when physical and chemical fitness and costs of acquiring, mining, shipping and handling were considered. Some shales were rejected because they contained objectionable percentages of silica sand. Some clays were rejected because, in spite of their extreme fineness, they failed to develop satisfactory plasticity.

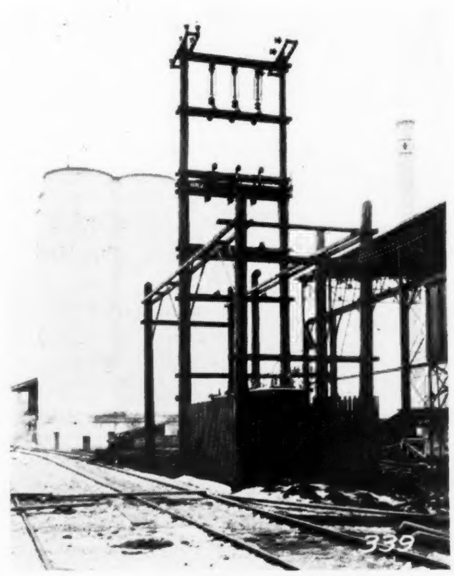
Coal

Fuel for burning the clinker is purchased from the Pacific Coast Coal Co., another subsidiary of the Pacific Coast Co. Buckwheat size coal is used, requiring no crushing before entering the dryer and pulverizing mills. A typical analysis of the coal, dry basis, is volatile 33.65, fixed carbon 54.77, ash 11.65, B.t.u. 13,250. At times it may be necessary to burn sub-bituminous coals, high in fixed gases, and the necessary provisions have been made for doing so.

Power

Energy for operating the plant is purchased from the lighting department of the city of Seattle on a 20-year contract. During an 18 months' period of construction and adjustment the billing was on a kilowatt-hour basis, thereafter on the monthly maximum demand.

Among the unique features of the power contract are: The contract was prepared by the engineers of both parties to it; both parties have independent sets of meters of either of two specified types; for billing purposes the two sets of meters are read simultaneously by representatives of the two parties and the bill is agreed upon by designated representatives of the two parties before it



Transformer substation receives power at 26,000 v. and delivers it to the plant at 2300 v.

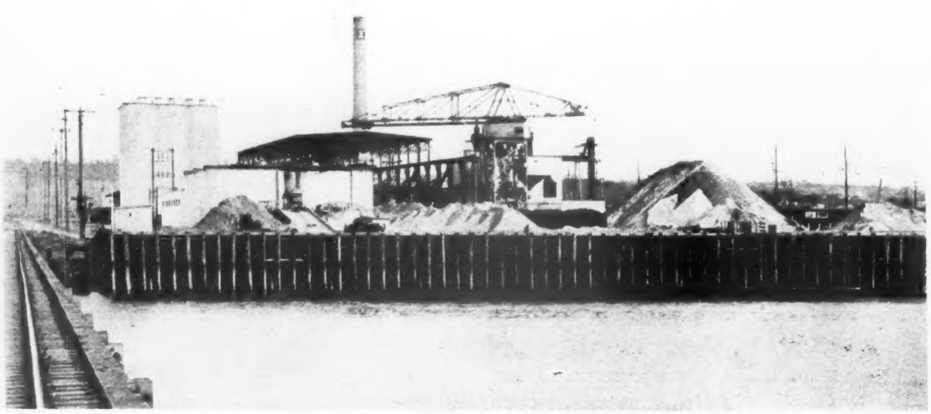
is rendered. Adequate provisions are made for arbitration of differences, if occasion for it should arise.

Water

The water department of the city of Seattle furnishes all water service, including fire protection. An adequate supply of fresh water can be obtained from wells on the property if conditions should warrant sinking them.

The Quarry

The quarry is on a peninsula on the east coast of Dall Island, between Baldy Bay and



The plant as seen from Harbor Island

Tlevak Straits, and about 40 miles west of Ketchikan. It is reached from Dixon's Entrance through Cordova Bay.

During the winter of 1925-6 a thorough study was made of every procurable publication on the geology of southeast Alaska, and every available authority on the limestone deposits of the district was consulted, with a view to finding a deposit of suitable rock so located as to insure safe and economical mining and transportation.

In the summer of 1926, three parties of the company's mining and consulting engineers and geologists prospected the territory, and the Dall Island deposit was selected as the only one likely to warrant development. At the same time independent investigations of best methods and probable costs of transporting rock to Seattle were made by the company's engineers and by officers of the Pacific Coast Steamship Co., a subsidiary of the Pacific Coast Co.

During the winter of 1926-7 an engineering party, including four seafaring men with years of experience in Alaska waters, spent a month surveying the deposit, examining possible wharf sites and making soundings. In March and April, 1927, a topographic survey was made, diamond drill holes were put down and further soundings were taken; and in the spring of 1927 the U. S. Coast and Geodetic Survey surveyed, sounded and wire-dragged Baldy Bay, carrying their work in great detail up to the wharf site selected in View Cove.

In February, 1928, the *S. S. Mazama*, chartered by the Pacific Coast Engineering Co., general contractors, took from Seattle to View Cove a full cargo of supplies, construction materials and plant equipment and a construction crew of 65 men under D. C. McDonald, superintendent of construction.

The ship lay at anchor in View Cove about ten weeks serving as warehouse and living quarters while work ashore progressed sufficiently to permit the landing of the ship's cargo on a rocky, timber-covered shore, with no beach and with a daily tidal range of 12 to 16 ft. A radio station was established immediately upon the arrival of the *S.S. Mazama* in View Cove, and the operation was in daily comunication with Seattle. The first cargo of crushed rock was delivered in Seattle, October 31, 1928.

Excavating for ground storage of crushed rock at the Dall Island quarry

During the development period drilling was done with pneumatic machines, but during the past season a Sanderson-Cyclone No. 14 standard well drill was used. Rock is loaded at the face with a 50-B Bucyrus electric shovel with Ward-Leonard control into 8-yd. steel, pan-type, standard-gage quarry cars built by the Pacific Car and Foundry Co. of Seattle. Two 8-ton Plymouth gasoline locomotives haul the cars over 56-lb. rails to the crushing plant, which contains one Traylor 48-in. by 12-ft. feeder, one Traylor steel-frame 42x48-in. "Bulldog" jaw crusher and one No. 5040 Dixie "Mogul" standard hammer mill, the crushers being driven by General Electric 125-hp. and 150-hp. motors respectively. The plant is designed to handle from 100 to 125 tons of rock per hour.

Crushed rock is delivered by an 18-in. belt conveyor from the hammer mill to the rock storage pit cut into the solid rock of the hillside above the wharf. A 36-in. belt running about 300 ft. per min. on "Rex" (Chain-Belt Co.) rolls receives the rock through chutes in the roof of a tunnel under the storage pit and delivers it through a loading tower on the edge of the wharf into the holds of the rock-carrying ship at the rate of 700 tons per hour.

Owing to the character of the location, no fresh water is available in dry seasons, and consequently a Diesel-electric power plant was installed. It contains two Fairbanks-Morse, six-cylinder, 360-hp., 240-k.v.a., 2300-v., 3-phase generating sets, pumps, Ingersoll-Rand air compressors, etc. The switchboard was built in the Westinghouse shops in Seattle.

Rock Transportation

Rock is carried to Seattle in 6200- to 6400-

Wash mill and emergency storage of clay

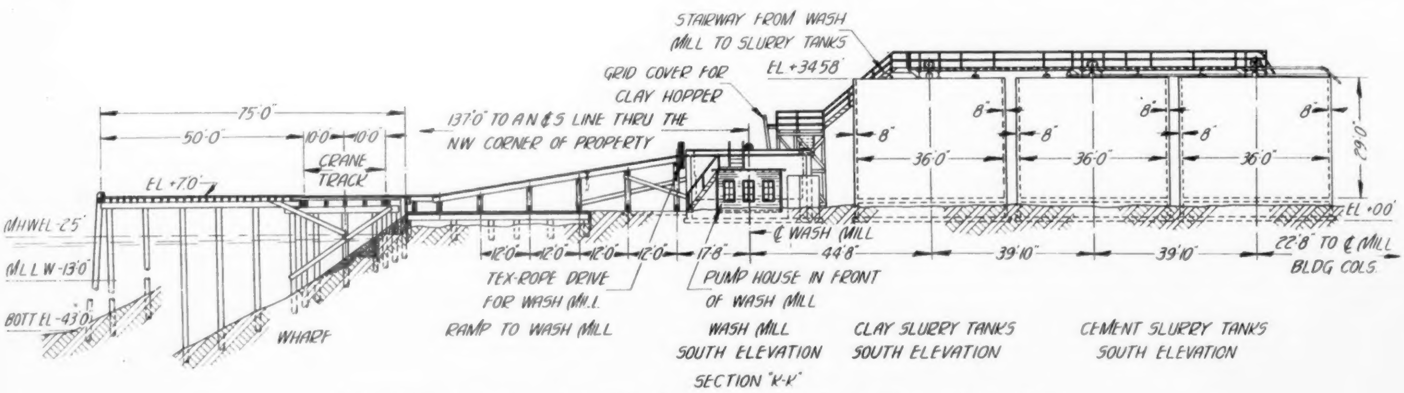
Crane yard-storaging rock at the plant

The S. S. "Diamond Cement," limestone carrier for the new mill, in Seattle harbor

ton cargoes by the *S.S. Diamond Cement*, owned and operated by the Pacific Coast Steamship Co. From 8 to 10 days are required for the round trip, depending upon weather conditions and upon special freight to be handled. The average for the season was approximately 8½ days. The ship is loaded in 8 to 12 hours, and its cargo is discharged in 30 to 36 hours.

Unloading Wharf

At the plant in Seattle 400 ft. of brush and pile bulkhead were removed, and 50,000 yd. of sand was moved by a clam-shell dredge to provide a berth alongside the wharf and a channel from the Duwamish Waterway to the wharf in East Waterway. A wharf 75 by 400 ft., designed by the company's engineers, was built, all piles being creosoted and ranging from 35 to 75 ft. long. Along the inner side of the wharf is the track for the unloading crane, each rail being carried on three rows of piles with 14-in. butts. Back of the wharf is a 40-ft. planked platform upon which the rock is discharged from the ship. The channel and berth were dredged, and the wharf was constructed by the McEachern Construction Co. of Seattle.



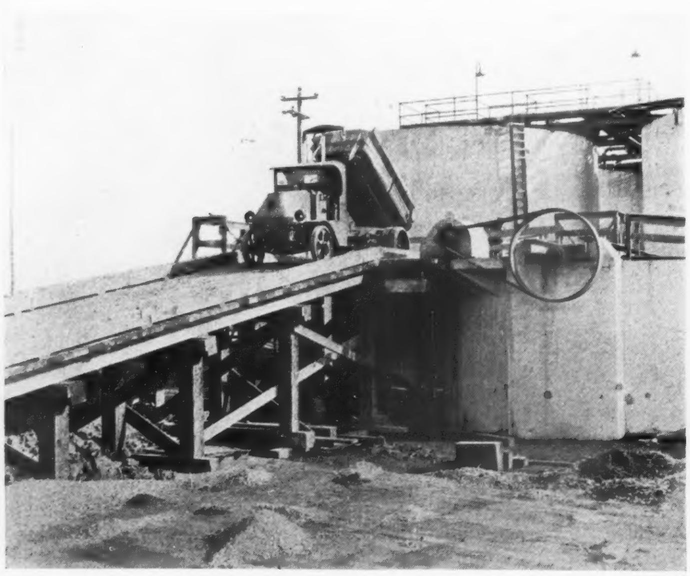
Cross-section elevations of wharf, wash mill and clay-slip tanks

Hammerhead Crane

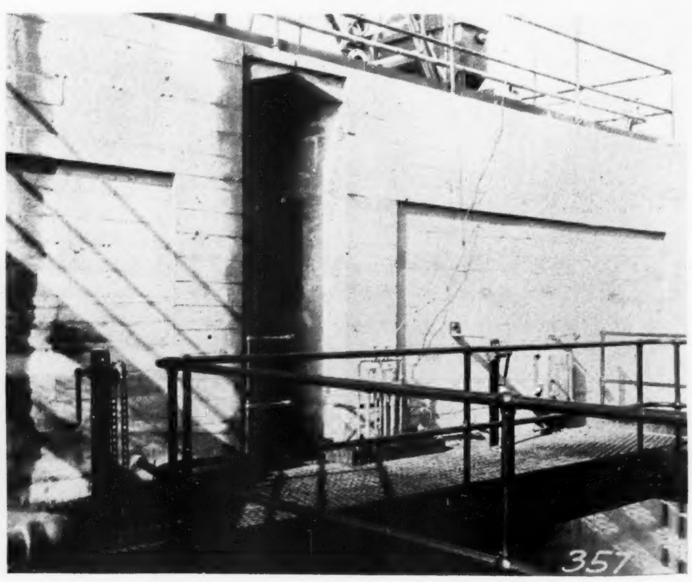
In a thorough investigation of the current methods of carrying and discharging bulk cargoes of inexpensive materials it was found that ordinary three-island freighters, procurable at relatively low cost, should be used; and that the discharging gear should be on shore and should serve other purposes. This led the company's engineers to conceive the combination of a hopper, a feeder and a belt conveyor with the so-called hammerhead crane, so common at Pacific coast cargo sawmills and made chiefly on Puget Sound.

The crane at the Pacific Coast Cement Co.'s plant was designed and built by the Colby Steel and Engineering Co. of Seattle. The steel was fabricated by the Wallace Bridge and Structural Steel Co., and the gear sets were made by the Western Gear Works, both of Seattle. Westinghouse motors and controls are used. Remote control of all motors used in unloading ships is feasible.

The crane has a capacity of 13 tons at a radius of 100 ft. It handles a 4-yd. Owen fleeting line, clean-up bucket and discharges cargo from the ship's hold, through the hopper and belt conveyor carried on the portal, and into the cargo dump at an average rate



A motor truck at the top of the ramp dumping a 5-cu. yd. load of clay to the wash mill



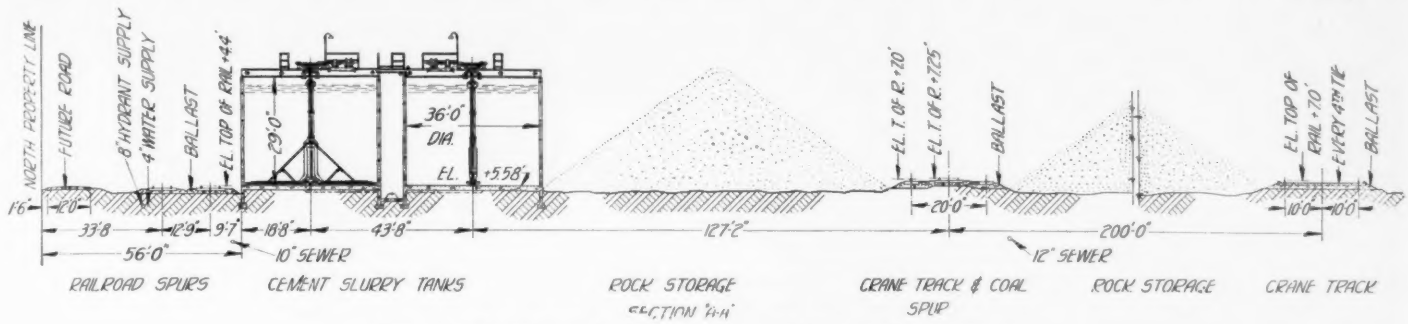
Just above the dust chambers showing the slurry feeder, walkways and cleanout doors

of 225 tons per hour. Its maximum runs as high as 275 tons per hour. One craneman handles the crane in the yard. In discharging the ship's cargo two additional men are used, one hatchtender and one man to look after the hopper and belt conveyor on the crane.

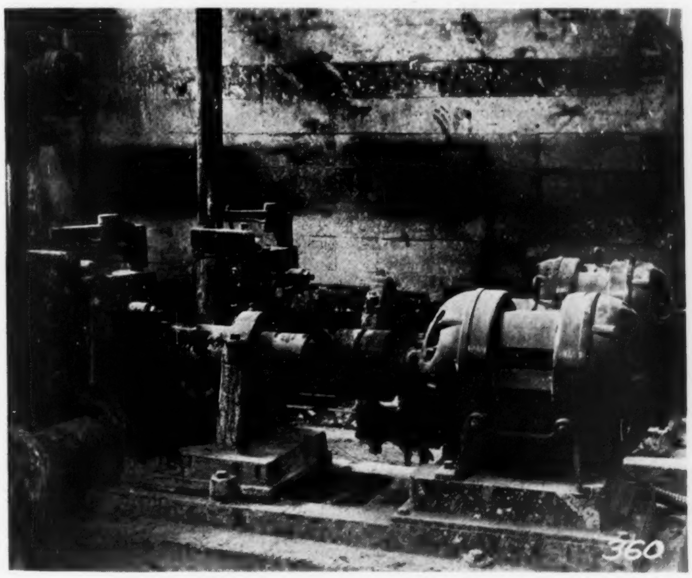
In the absence of the ship, the crane yards the rock out to storage from the cargo dump and recovers it from storage to place it directly in the raw-mill feed bins, or within reach of the bridge crane, which can feed both raw and finishing mills. In order to enable it to cover the 100,000-ton storage yard, the crane has articulated trucks which allow it to traverse a curved track of 100-ft. radius leading to the south side of the yard, and a turntable is provided on the wharf for transferring it to a track through the middle of the yard. The track consists of 100-lb. rails on 20-ft. centers, on 10x10-in. ties on 20-in. centers. Ties are 6 ft. long, except every third member, which is 26 ft. in length.

Clay is mined by gasoline shovel and delivered by truck under contract. By means of ramps the trucks dump their loads directly into the washmill, or into storage, as conditions require. Provision is made for adding facilities for receiving clay by rail or by scow, or for receiving clay slip by scow or barge, also for adding a clay storage building if found desirable.

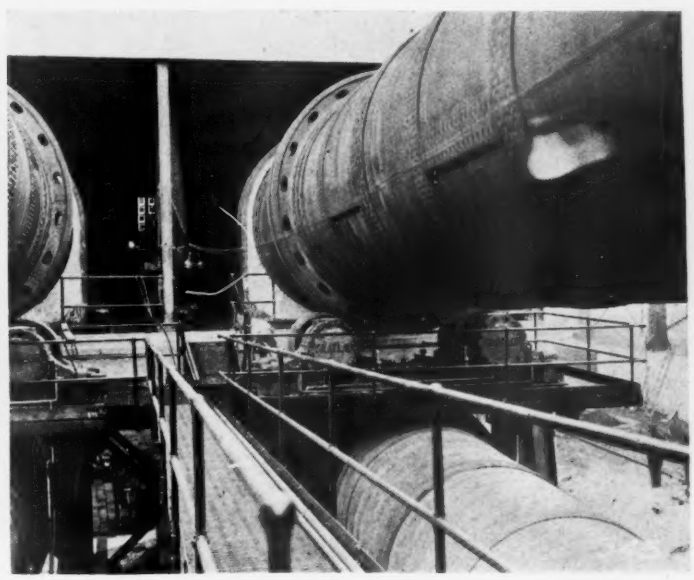
The mechanism for the 26-ft. washmill was furnished by the Traylor Engineering and Manufacturing Co. It is without a step bearing, all revolving parts being suspended from girders across the tank. The tank is circular in section and is reinforced much as a slurry tank would be. This design was found to be cheaper than the more massive octagon commonly used. The bottom of the tank is separate from the walls, the design



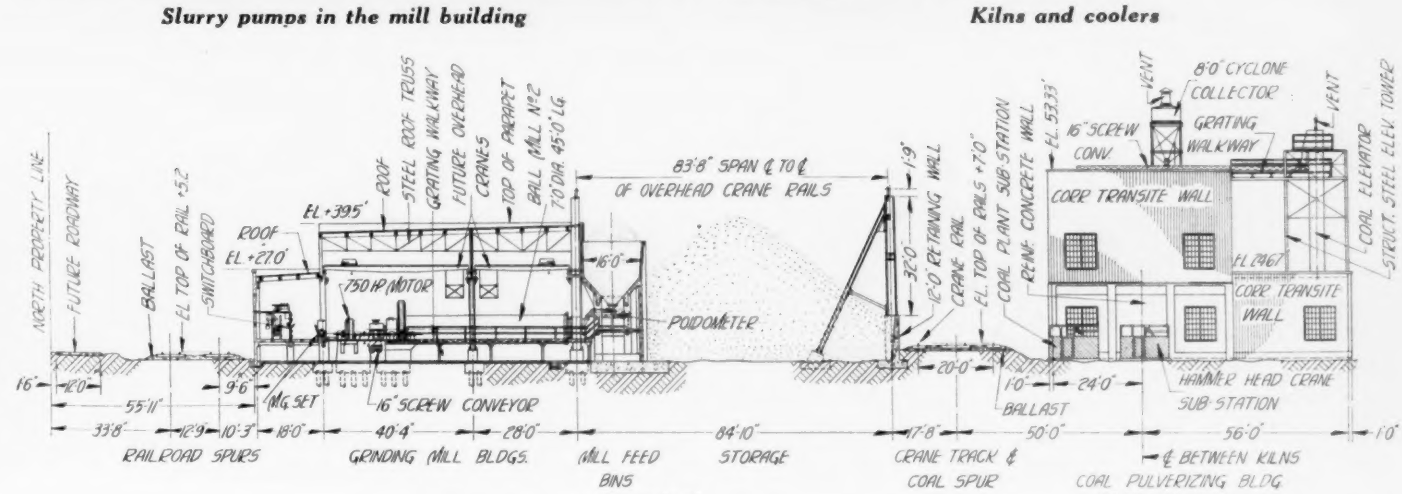
Cross-section through slurry tanks and raw material storage



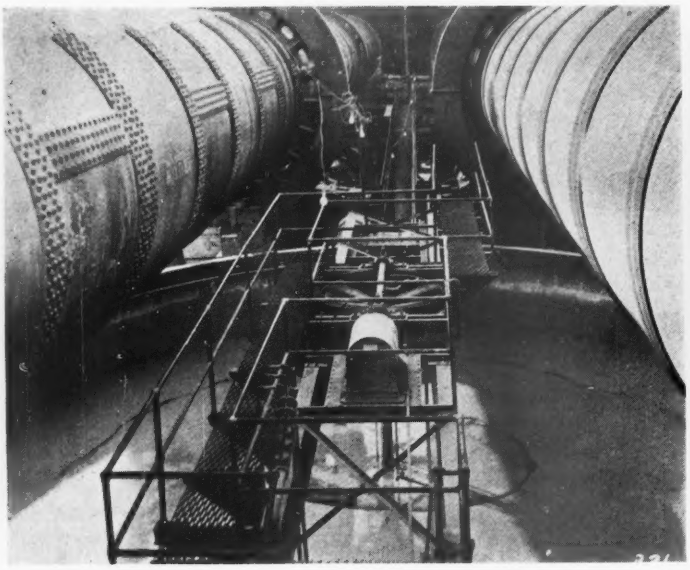
Slurry pumps in the mill building



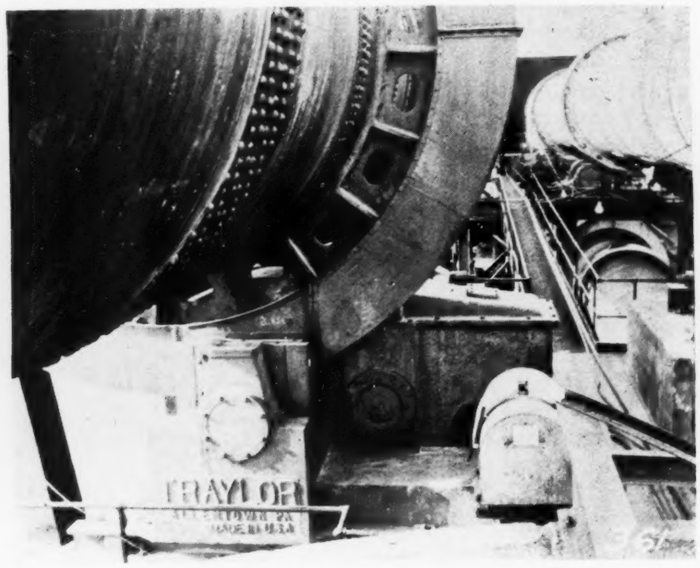
Kilns and coolers



Cross-section and elevation of the grinding mill building, storage and coal pulverizing mill



Kiln tank between piers Nos. 3 and 4, showing the drive mechanism for the mixers



Motor and enclosed gear set driving a kiln; one of the four sets of single-roll supports shows also

being substantially the same as that worked out for slurry tanks and described elsewhere.

The washmill is driven through a "Texrope" drive by a General Electric 75-hp. 2300-v. motor. Slip, 90% to 98%, of which will pass a 200-mesh screen, is pumped from the washmill to three reinforced-concrete tanks, 36 ft. in diameter and 29 ft. deep, by a Wilfley 4-in. pump driven by a Westinghouse 25-hp. motor. Each tank holds sufficient clay slip to make 6000 bbl. of cement.

The percentages of water and solids in the clay slip are adjusted to a standard in the tanks before going to the raw mills. Both tanks are connected, through Record cut-off valves, to an 8-in. pipe line, which enters the mill building, and delivers slip through a "Barco" valve into a sump ahead of a 4-in. Wilfley pump driven by a 25-hp. Westinghouse motor, the Barco valve being adjusted to take care of the requirements of the raw mills. The Wilfley pump delivers the slip to Traylor ferris-wheel feeders ahead of the raw mills, the overflow from the feeders returning to the pump sump.

Raw Grinding

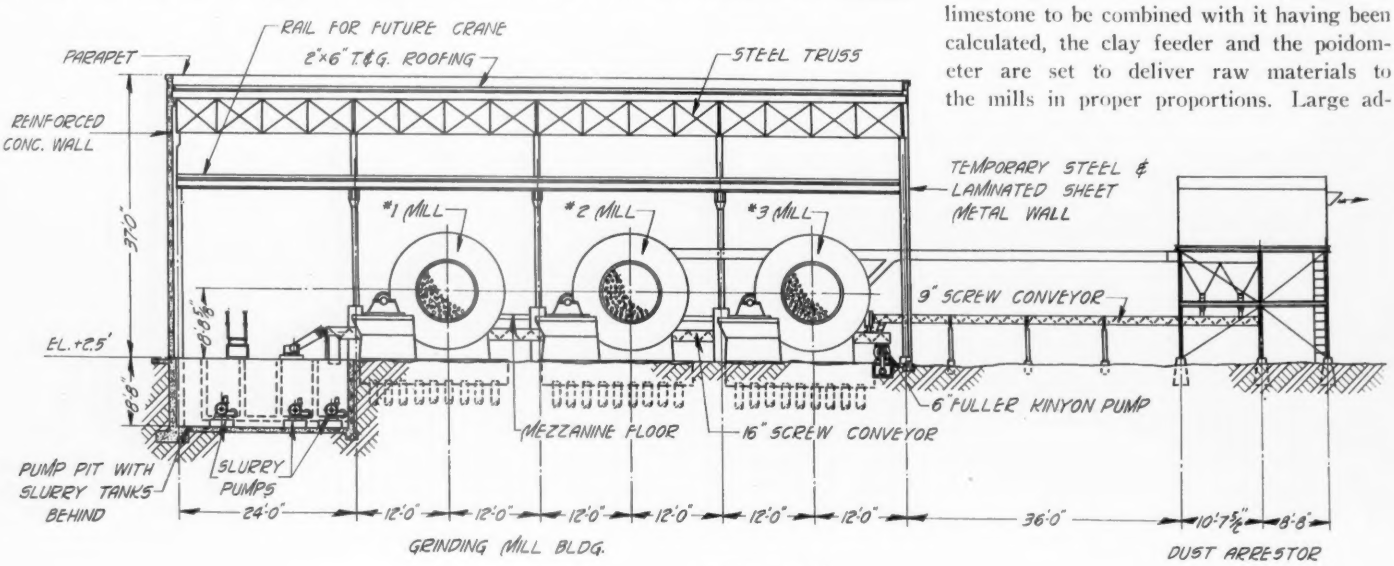
The Traylor compartment mills, both raw and finish, are 7 ft. in diameter by 45 ft. long, and each is driven through a pin-type flexible coupling by a General Electric supersynchronous motor, rated at 750 hp. at 90% power factor and at 40 deg. temperature rise. The motors run 180 r.p.m, and drive the mills at 20.3 r.p.m. Separate, pile-supported foundations are provided for the mill bearing and for the motor, one disk of the flexible coupling being carried on the pinion shaft, and the other on the pinion shaft extension, which is rigidly connected to the motor shaft and runs on a single bearing on the motor foundation.

The mill shells are made of 1⅛-in. steel plate, with buttstraps 1¼ in. thick. The heads are annealed low-carbon steel castings, to which are bolted separate steel trunnions 38 in. in diameter and 24 in. long, running in bronze-lined ball and socket bearings, completely enclosed, and lubricated by oil continuously circulated by bucket wheels.

The first compartment is 9 ft. long, the second 11 ft. long, and the third 25 ft. long. Linings throughout are of heat-treated chrome steel, those in the first compartment being 2⅝ in. thick with 1½-in. projecting ribs. Grinding bodies range from 4-in. Lorain balls to ⅝-in. by ⅝-in. Philadelphia Steel Co.'s heat-treated slugs.

Crushed rock, delivered into the reinforced-concrete mill bins by either the hammerhead crane or the bridge crane, is fed to mills by 20-in. Schaffer poidometers. Clay slip is supplied to the mills by Traylor ferris-wheel feeders, direct-driven by the poidometers.

The crushed limestone is so uniform in composition that its calcium content is definitely known. A tank of clay slip having been analyzed, and the correct quantity of limestone to be combined with it having been calculated, the clay feeder and the poidometer are set to deliver raw materials to the mills in proper proportions. Large ad-

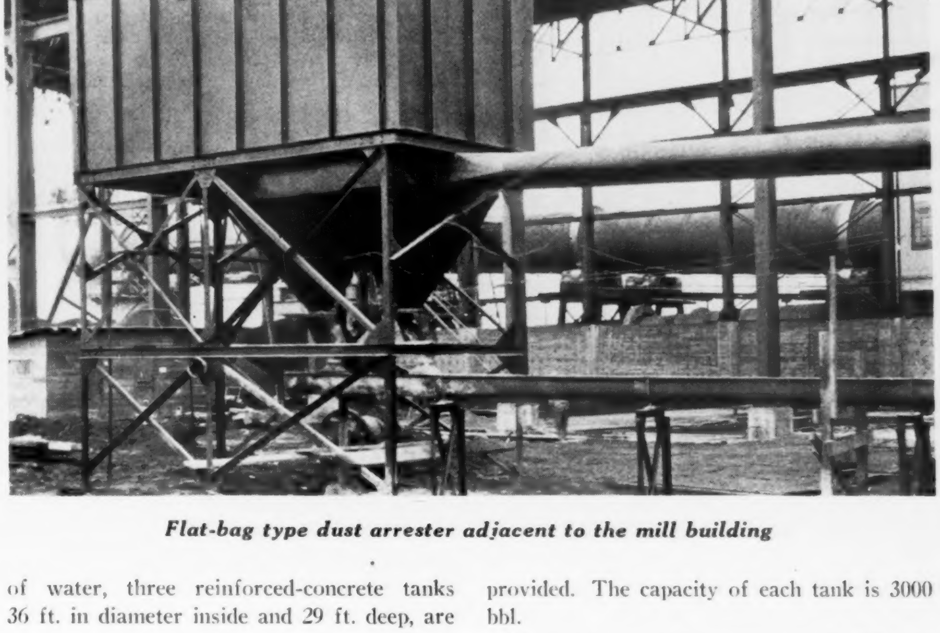


Cross-section and elevation of grinding mill building

justments are made by changing the number or the position of clay-feeder buckets, small and precise adjustments by the settings of the weight on the poidometer scale beam. The rate of feeding the mill is governed by controlling the speed of the poidometer motor by means of Allen-Bradley carbon-pile controllers.

Hourly acid-alkali checks are made on the output of the mills, and each tank of slurry is analyzed before being pumped to the kiln tank as precautionary measures. Blending will be necessary only in cases of emergency, and can be done partly by mixing while pumping to insure very intimate mixing. All the advantages of grinding together in a tube mill the exact quantities of raw material required in the slurry are fully realized.

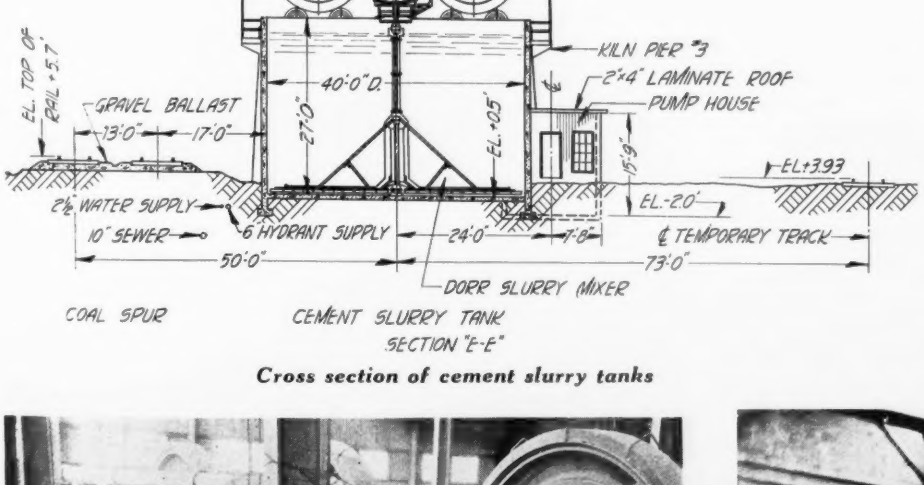
Slurry from the raw mills is carried to the pump sump by a 16-in. screw conveyor driven through a Caldwell herringbone speed reducer by a 5-hp. Fairbanks-Morse motor.



Flat-bag type dust arrester adjacent to the mill building

Slurry Handling System

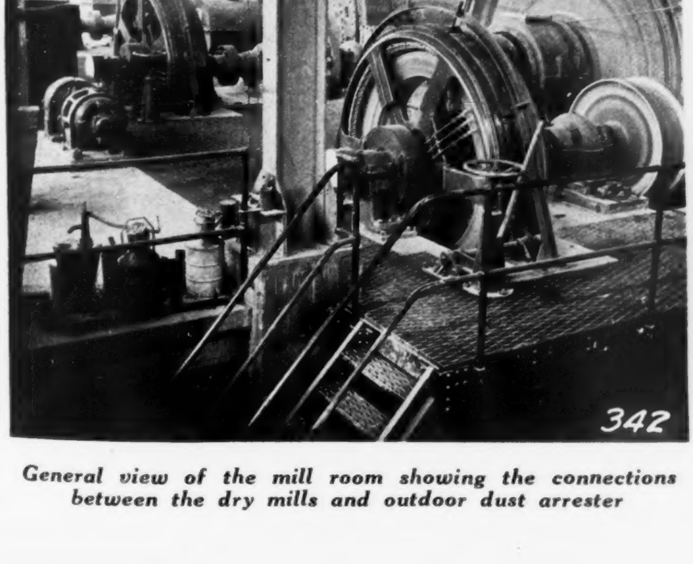
For storing and handling cement slurry, which is ground to a fineness of 90% through 200-mesh and carries 35 to 36% of water, three reinforced-concrete tanks 36 ft. in diameter inside and 29 ft. deep, are provided. The capacity of each tank is 3000 bbl.



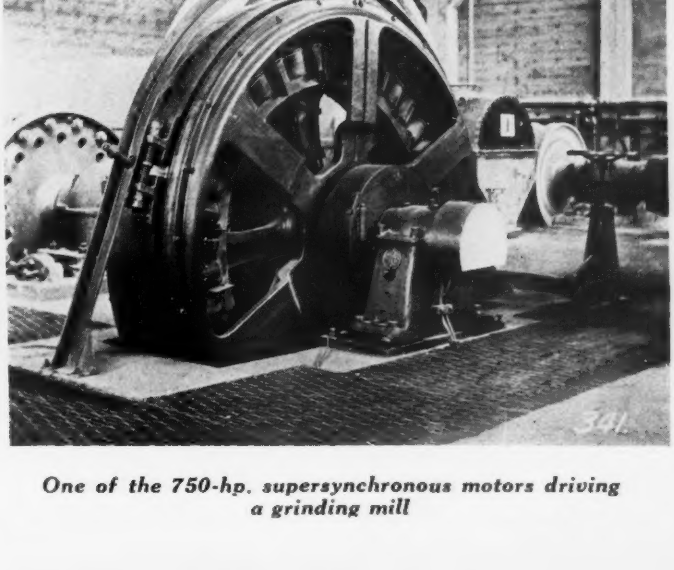
Cross section of cement slurry tanks

The tanks were built on a sand fill, and the walls were completed first, on footings 12 in. deep and 24 in. wide. They were then back-filled with sand, settled in water, and reinforced bottoms, independent of the sides, were put in. Steel outlet pipes for slurry were placed in the bottom slabs, and passed out through oversize holes in the tank walls. Space left between the wall and bottom was calked with oakum, and poured full of asphalt. The inside surfaces of walls were coated with asphalt about 1/32 in. thick.

From each tank an independent line runs into the mill building, and each tank can be emptied into either of two pump sumps there. At the tank a Record valve is provided as a cut-off valve, and in the mill building three-way, three-port Barco lubricated plug valves



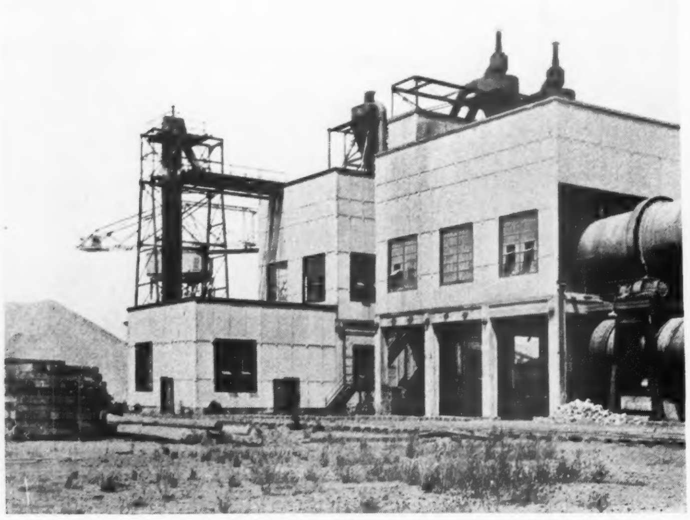
General view of the mill room showing the connections between the dry mills and outdoor dust arrester



One of the 750-hp. supersynchronous motors driving a grinding mill

are used for controlling the rate of flow of slurry to the pump sumps.

In a pump pit in the mill building provisions are made for four Wilfley 4-in pumps. One takes slurry from the raw mills to any one of the slurry tanks. Since this service must be continuous, the second pump, which ordinarily would pump from tank to tank for mixing, or from corrected tank to kiln tank, is so connected as to serve this purpose in emergency. The third pump can relieve the second pump, or the fourth pump, which is for continuous duty pumping clay slip to the raw mills.



Coal plant and firing floor

Under the kilns, between piers No. 3 and No. 4, is the kiln tank, 40 ft. in diameter inside, and 25 ft. deep. Wilfley pumps deliver slurry from this tank to Traylor ferris-wheel feeders on top of the dust chambers, the excess returning to the tank.

All slurry tanks are provided with Dorr mixers, driven through Philadelphia speed reducers by Allis-Chalmers motors with Allen-Bradley starters. All Wilfley pumps are identical except as to impellers, of which two sizes are used. Motors vary in size and speed to suit requirements.

Coal Plant

Coal from the mines of the Pacific Coast Coal Co. is delivered in bottom-dump cars by the Pacific Coast Railroad Co. Owing to the close affiliation of the cement company with the coal and railroad companies, only a small stock of coal is carried at the cement plant.

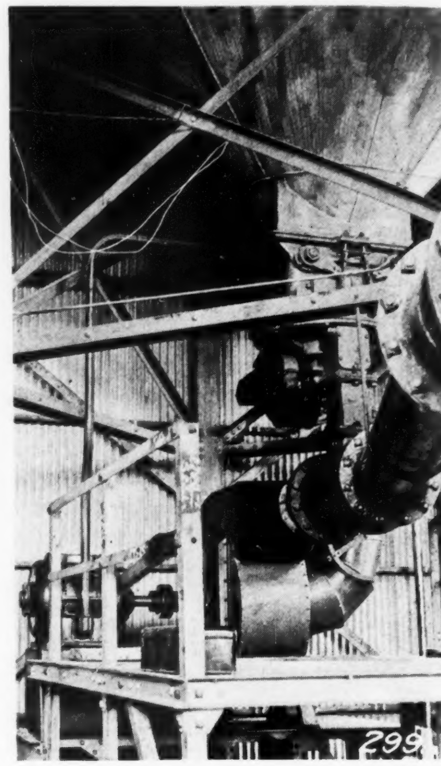
A track for loaded coal cars is provided between the rails of the crane track which runs through the middle of the rock storage yard, the portal of the crane having been designed to clear the coal cars, and to permit the use of the two tracks independently. A passing track facilitates the economical handling of coal cars.

From a track hopper of one car capacity, the coal passes directly by drag-chain conveyor to a York 80-in. by 40-ft. dryer, and thence by screw conveyors and bucket elevators to hopper-bottom, cylindrical, dried-coal tanks above two Raymond, five-roller pulverizers, located on the floor above the dryer. Space is provided for a third coal pulverizer and its bin. The track hopper and conveyor and elevating machinery were built and installed by the Link-Belt Meese and Gottfried Co.

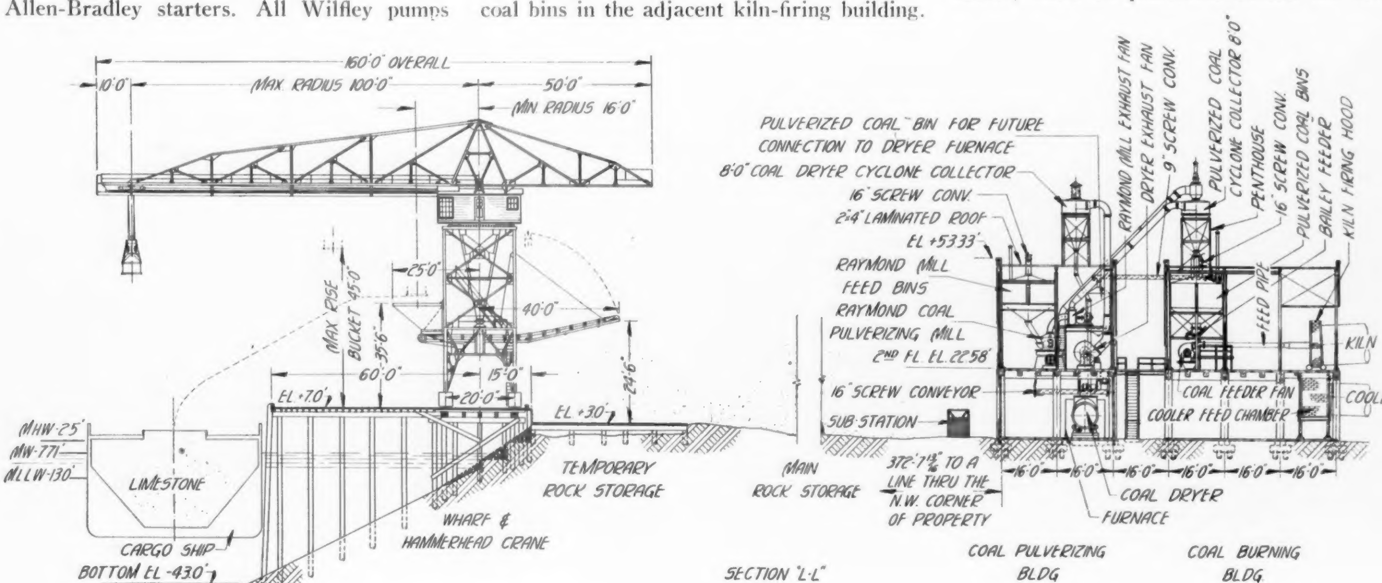
Pulverized coal is delivered by the mill fans to cyclone collectors over the pulverized coal bins in the adjacent kiln-firing building. Mills and mill fans are driven by General Electric 75-hp., 2300-v. and 40-hp., 440-v. motors, respectively. Coal dryer, coal-dryer fan and conveying and elevating machinery are driven by Fairbanks-Morse motors.

Firing Floor

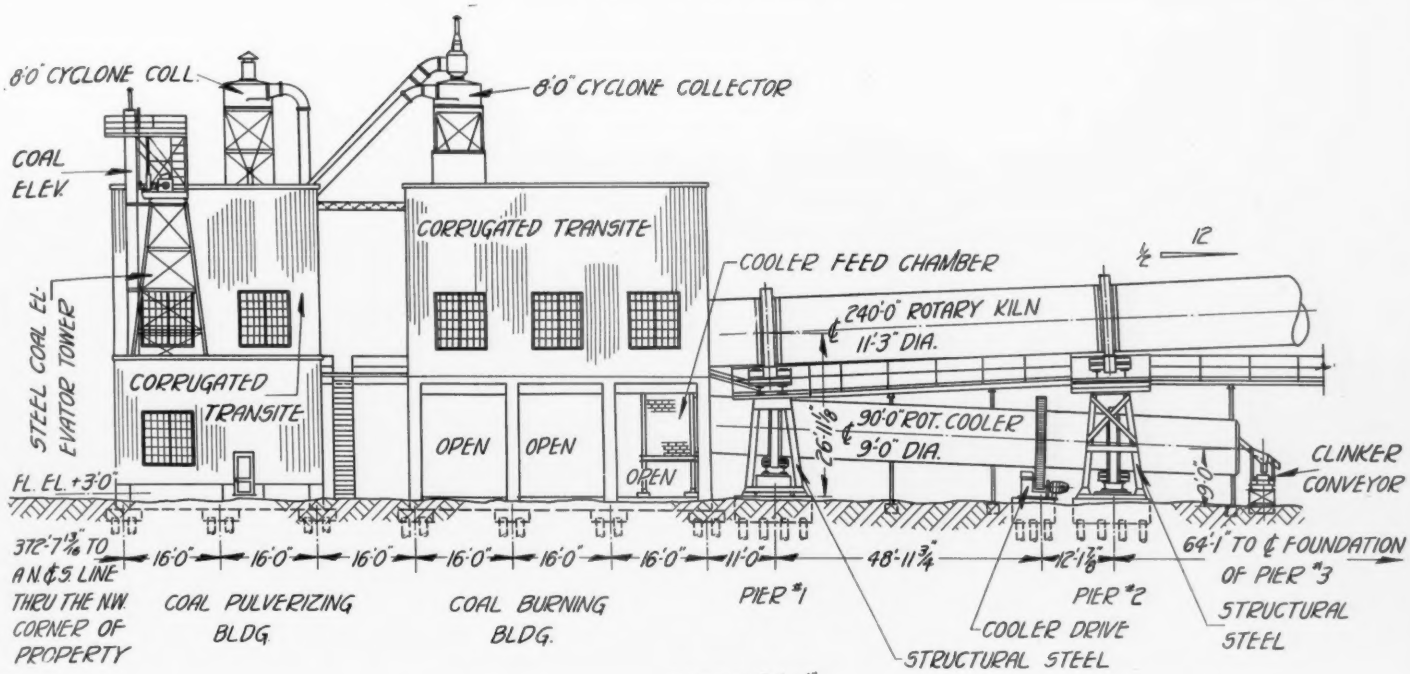
Above the firing floor are two hopper-bottom, cylindrical, powdered-coal tanks, under each of which is a Bailey No. 120 coal feeder, driven by a Westinghouse, variable-speed, direct-current motor with 70 points on its controller. Two 55E, slow-speed, American blower fans, each driven by a General Electric 50-hp., 900 r.p.m., 440-v. motor, stand on platforms behind the feed-



Pulverized coal feeder and draft fan for the No. 1 kiln



Cross-section and elevations of hammerhead crane, unloading wharf, storage, coal pulverizing and burning buildings



Elevation of the coal burning plants and kilns

ers. Oversize fans were provided in order to meet the requirements of the different kinds of coal available, and to facilitate the control of kilns having a common chimney. Space for a third combination of coal tank, feeder, fan, and blast pipe is provided. The middle set is arranged to serve either kiln.

On the firing floor are the controls for all equipment involved in the operation of the kilns.

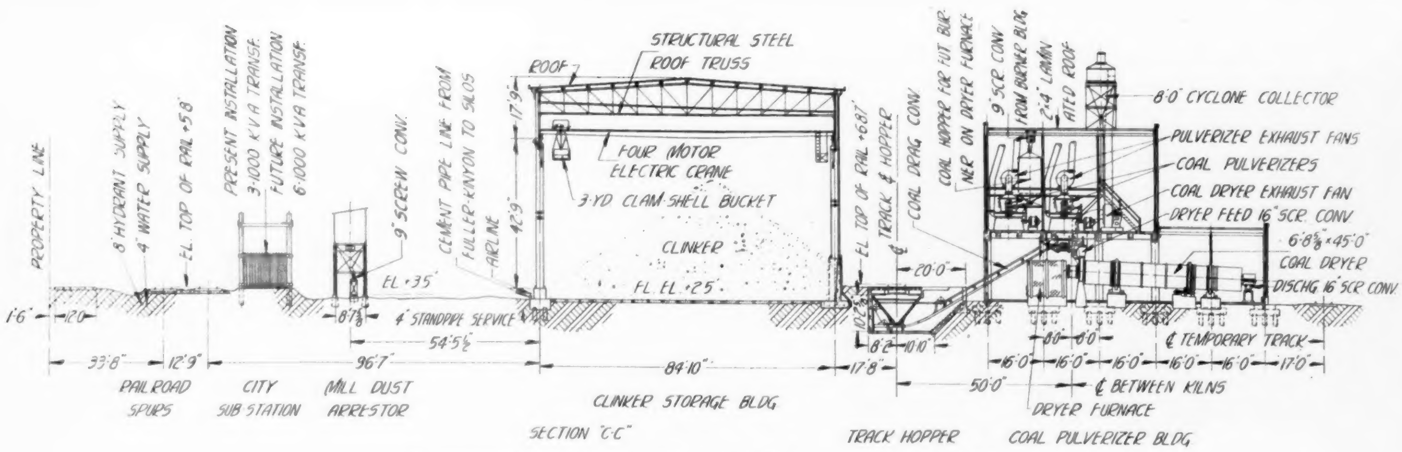
Kilns

The two Traylor kilns are 11 ft. 3 in. inside diameter and 240 ft. long. Each is carried on four sets of single-roll supports, and each is driven at ⅓ or ⅔ revolution per minute through an enclosed Timken roller bearing gear-set by a General Electric 50-hp. slip-ring motor running 600 to 1200 r.p.m. The kilns slope ½ in. per foot. Both the air seal rings and the firing hood frames were furnished by Traylor Engineering and Manufacturing Co.

One kiln is lined with 70 ft. of 9-in. "Kruzite," 50 ft. of 9-in. "Empire," and 120 ft.

The kilns as seen from the firing floor

View of the firing floor towards the stack



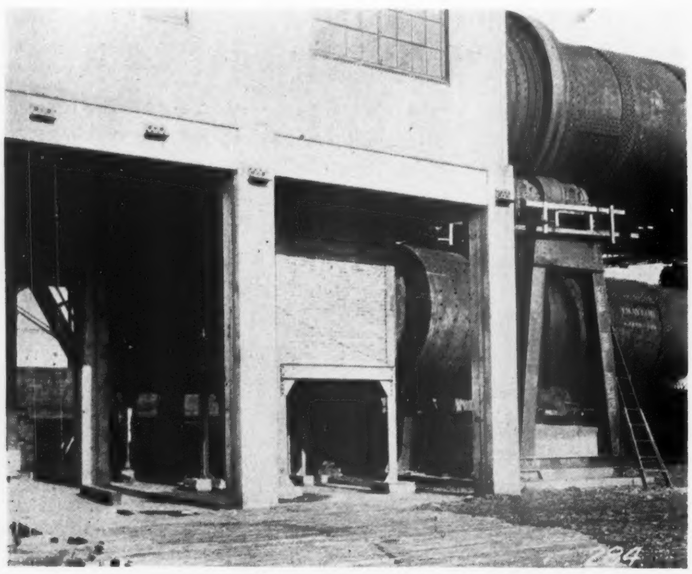
Cross-section and elevation of clinker storage building

of 6-in. "Empire" liners, made by the A. P. Green Co. of Mexico, Mo. The other kiln is lined with 120 ft. of 9-in. "Columbia" and 120 ft. of 6-in. "Columbia" liners made by Gladding McBean and Co. of Seattle.

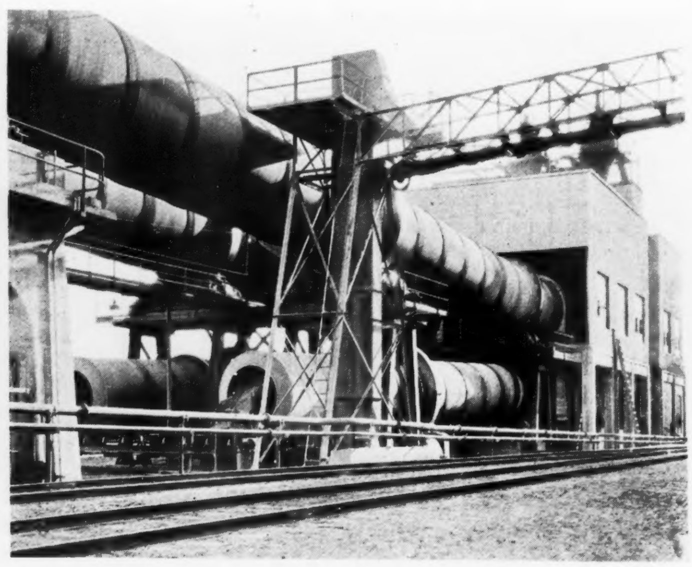
Clinker falls into brick chambers, carried on structural steel frames and lined with firebrick. Connections with the coolers are made through heavy, flanged, iron castings fitted with renewable alloy-steel wearing lips.

Coolers

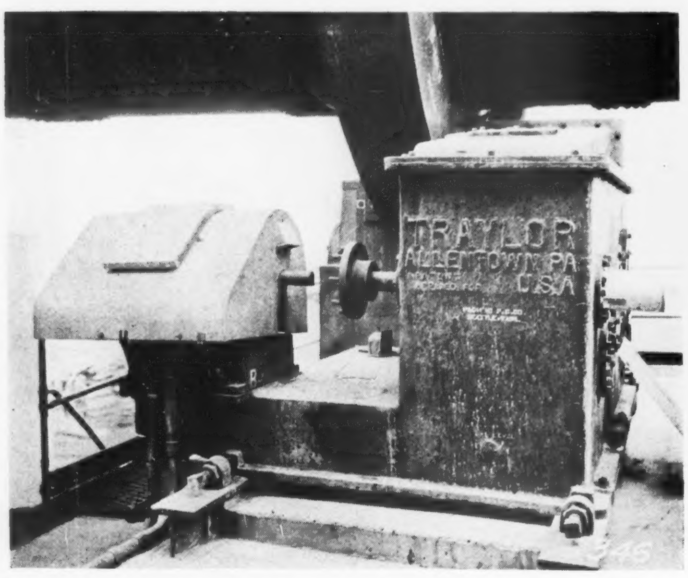
Under the kilns, carried on two sets of single-roll supports, at a slope of ½ in. per foot, and driven through enclosed, roller-bearing gear sets by General Electric 40-hp.,



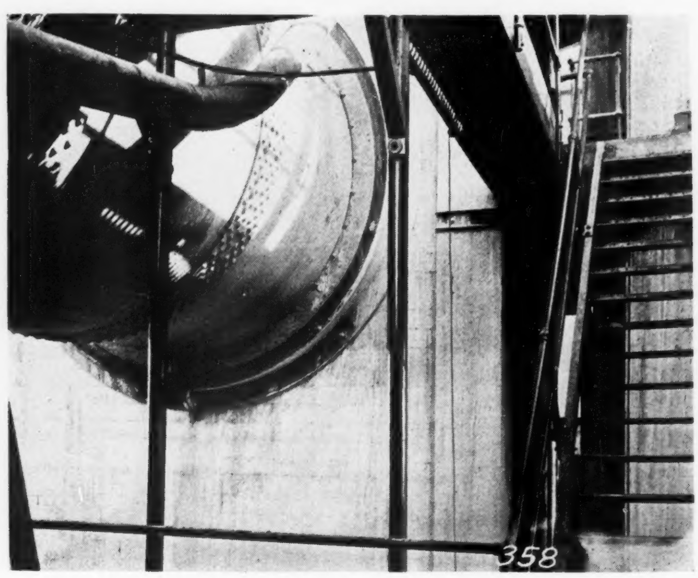
Corner of the burning building, showing the connections between the kiln hoods and coolers



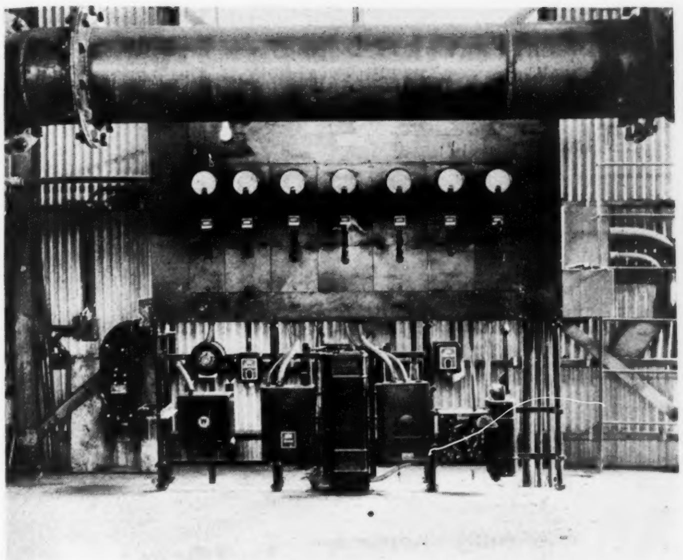
Kilns and coolers. The clinker discharges through chutes to a conveyor feeding an elevator



Each kiln is driven through an enclosed roller-bearing gear set by a 50-hp. motor



Seal ring on the No. 1 kiln. The pipe carries overflow from the slurry feeder



Switchboard and feeder panel for the No. 1 kiln located on the firing floor, showing controls and switches for the fan, coal feeder, slurry feeder and clinker conveyor

Interior of cooler, showing white iron liners, some plain, some with lifters for spilling hot clinker through air current, and some with plows for advancing hot clinker rapidly

440-v. motors, are two Traylor coolers 9 ft. in diameter and 90 ft. long.

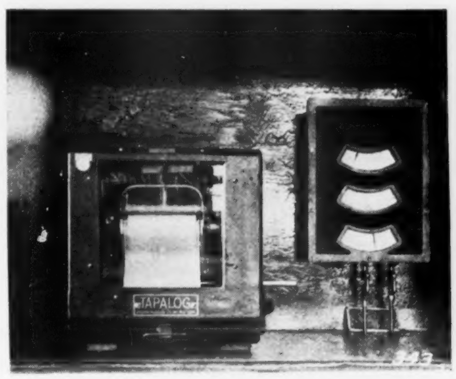
There are no refractory liners in the coolers. The upper end is lined with white iron plates, many of which carry lifters or plows. Steel lifters are used at the lower end, and lifting buckets are used at the lower end in order to make the cooler discharge at a high level for convenience in arranging the conveying equipment to which clinker is discharged.

The absence of refractory liners, the use of iron lifters in the hot end, and the low inclination of the cooler are all devices intended to expedite quick and thorough cooling, and to aid in producing a superior grade of clinker.

Kiln and Cooler Foundations

A departure from usual practice is found in the kiln piers. With the object of simplifying foundation problems, the foundations for the cooler supports were combined with those for kiln piers No. 1 and No. 2, and then, in order to improve ventilation and to increase accessibility, kiln piers No. 1 and No. 2 were made of steel. Incidentally, both the height of the kilns and the costs of the piers were diminished.

Kiln piers No. 3 and No. 4 are of reinforced concrete, pier No. 3 being somewhat unusual in appearance owing to the fact that its top was designed to accommodate the thrust and riding ring supports, gear box, and motor, while its columns and base were designed to carry the center of pressure over the center of the supporting pile group.

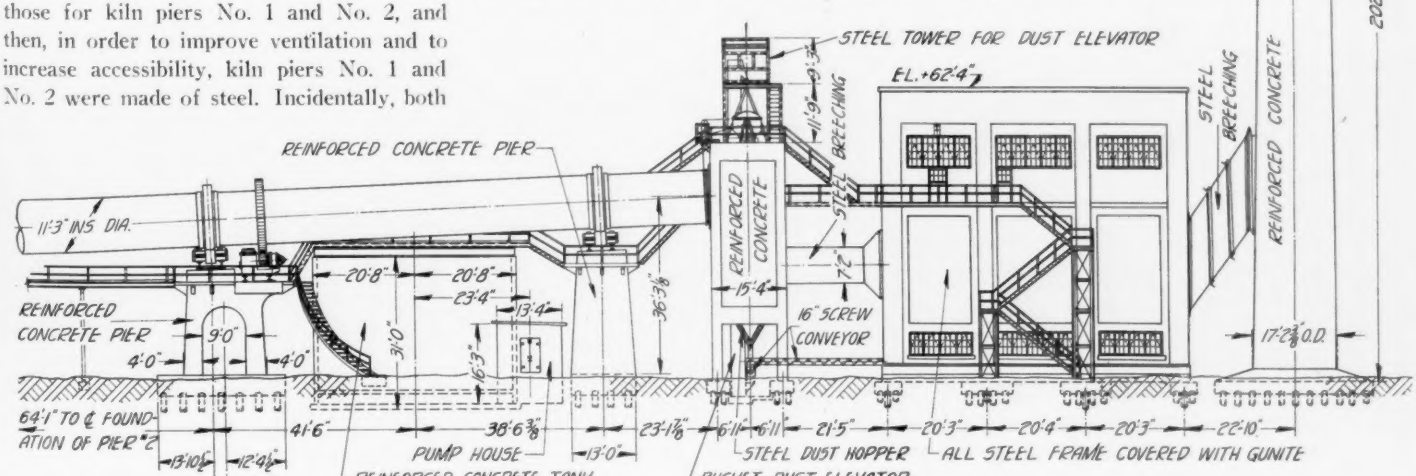


Pyrometer and draft gages on the firing floor

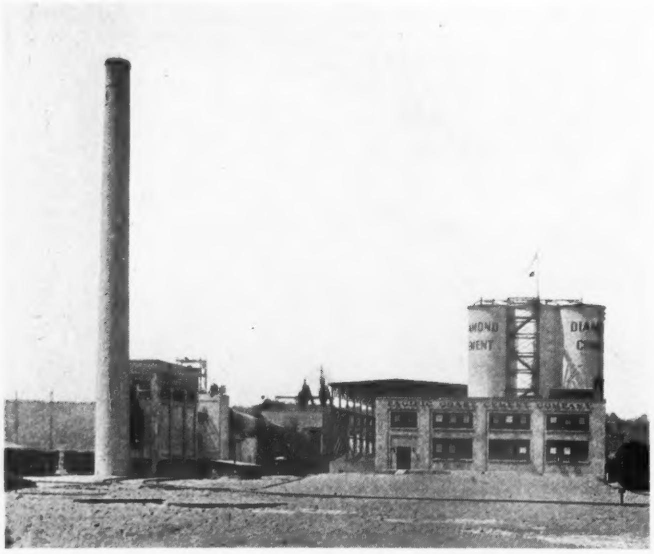
Dust Chamber and Breechings

At the feed ends of the kilns are reinforced-concrete dust chambers, lined with fire brick, and having hopper bottoms. Iron doors give access to the inside of the dust chambers and to the space between their firebrick arches and their tops. On the tops of the dust chambers are the ferris-wheel slurry feeders, and between them an elevator for returning collected dust to the kilns, if desirable.

Cylindrical breechings, proportioned to minimize



Cross-section and elevation of slurry tanks, precipitator building and stack



Concrete stack and dust chambers at one of the kilns

the settlement of dust in them, and fitted with water-cooled dampers and with expansion joints, connect the dust chambers with the Cottrell plant.

Cottrell Plant

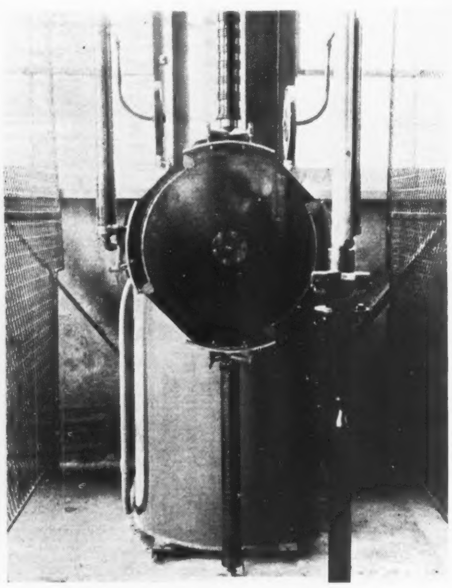
Flue gases are treated for the removal of dust in a Cottrell plant designed and built by the Western Precipitation Co. It is of the rod-curtain type, and consists of two units of three sections each, with common mixing chambers at entrance and exit, from which either unit may be shut off by means of dampers.

The plant is built on a structural steel frame of columns and beams, inclosed in concrete and tile walls and floors forming precipitation chambers, with dust collecting hoppers and conveyors below them, and with substation and operating floor above them. Stuccoed exterior walls, and steel sash give the plant the appearance of a rectangular building 32 ft. wide, 60 ft. high and 60 ft. long.

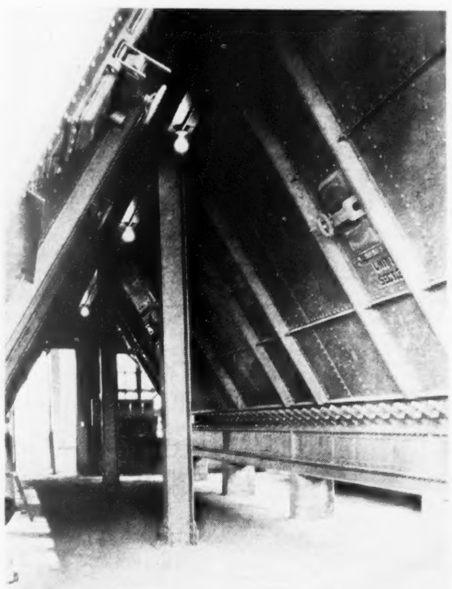
The discharge electrodes consist of twisted steel rods ⅛-in. square, suspended in frames supported on high tension insulators. The collecting electrodes are ⅛-in. steel pipes supported in frames, which are rapped periodically with air hammers to dislodge the dust. Screw conveyors under the dust hoppers discharge into cross-conveyors, from which the dust can be elevated and returned to the kilns, or can be discharged to waste.

At the west end of the plant, above the mixing chamber ahead of the treaters, is the substation which receives energy at 440-v. through a safety switch panel. Five dead-front panels, equipped with meters, switches, circuit breakers, and signal lights, control the flow of energy to five grille-enclosed compartments, each of which contains a high tension transformer, surmounted by a synchronous motor driving a disc type rectifier. Special devices in the leads from the rectifiers prevent any disturbance to radio reception in or near the plant.

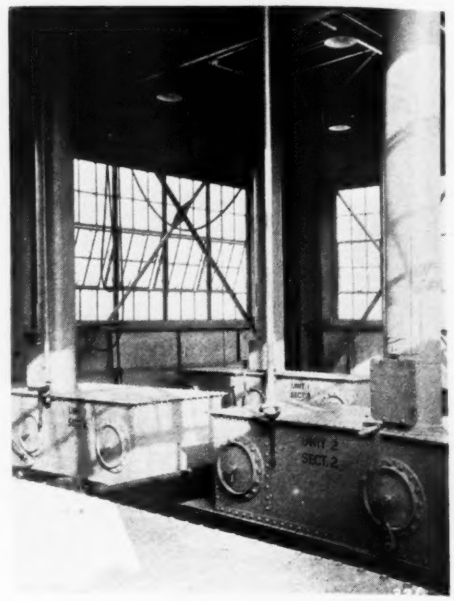
On the operating floor, which is separated from the substation by a glazed partition, are Shepard electric hoists for operating the dampers, air hammers for rapping dust from the electrodes, and switch operating devices for disconnecting the units from the overhead high tension conductors.



Disc type rectifier in the dust precipitation plan driven by a synchronous motor



Dust bins under the precipitation compartment



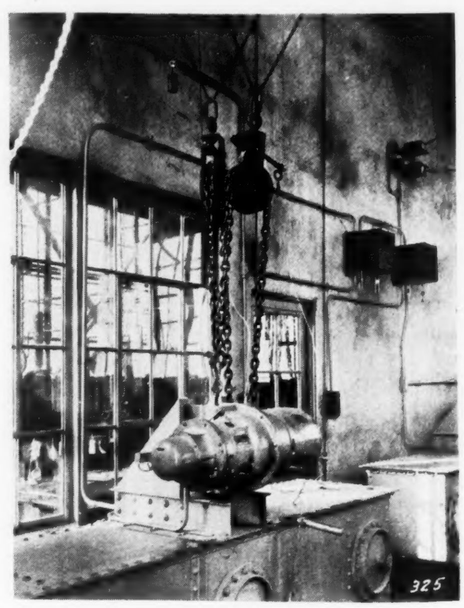
Operating floor of the dust precipitation plant

Chimney

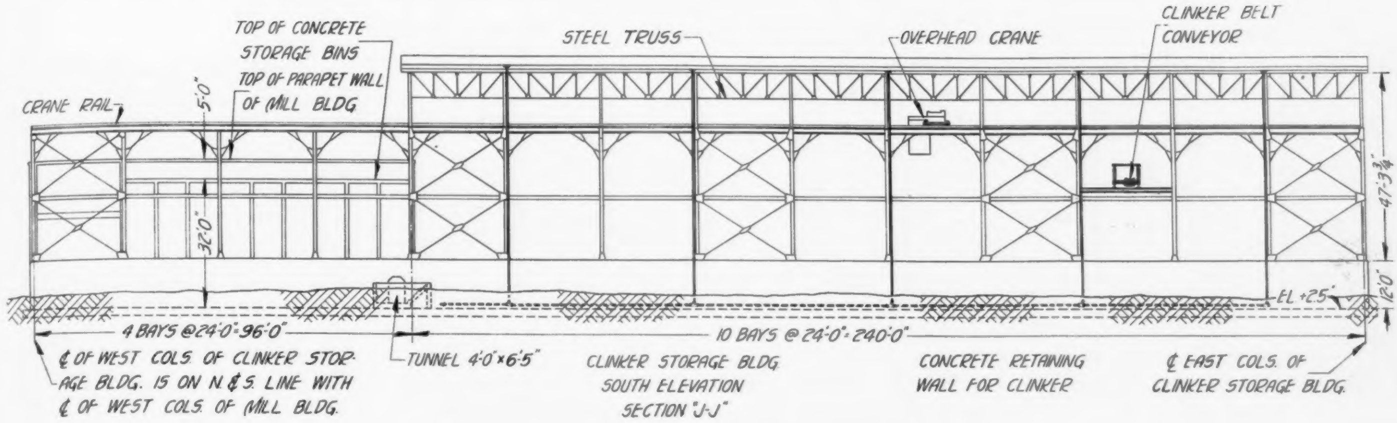
One reinforced-concrete chimney, 200 ft. high and 10 ft. in diameter, inside the lining, takes the gases from both kilns. The base of the chimney is a 35-ft. reinforced-concrete octagon, 5 ft. thick under the chimney, resting on a group of 97 piles, 36 ft. long. The chimney was built with movable metal forms by the Rust Engineering Co., according to the owner's general design and specifications, and includes Rust iron coping on the top, and Rust lightning rods. The top of the chimney is ornamented with red diamonds, visible at great distance from all directions.

Clinker Conveyor

Clinker, at a temperature of 90 to 120 deg. F. is discharged from the coolers into special chutes, to which grizzlies can be added, and



Insulator housing and electric hoist for operating dampers in electrical dust precipitation plant



Longitudinal section of clinker storage building

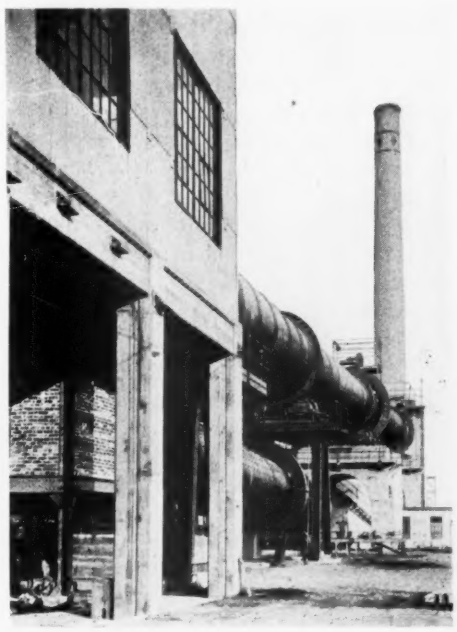
from which the clinker falls upon a Boston Woven Hose and Rubber Co. special conveyor belt, discharging to a bucket elevator. From the elevator head, the clinker is carried into the clinker storage building by a conveyor belt supported on a truss which spans the coal tracks. A continuous weighing machine can be installed at this point. The entire clinker conveying system was built and installed by the Link-Belt Meese and Gottfried Co.

Clinker Storage

The clinker storage building, fabricated and erected by the Wallace Bridge and Structural Steel Co. of Seattle, consists of ten 24-ft. bays, about 84 ft. wide, bounded at the west end by a reinforced-concrete tunnel connecting the mill building with the coal and kiln departments. The tunnel walls support pipes for slurry, water, and air, and conduit for power lines.

The south and east boundaries of the clinker storage area are 12 ft., reinforced-concrete, cantilever retaining walls. The north side of the building is incomplete except as to columns and their footings, pending the development of future plans.

For the handling of clinker and crushed stone, a 9-ton, 4-motor, Milwaukee bridge crane has been installed. It carries a 3-yd. Williams "Favorite" bucket. To permit the feeding of crushed stone to mill bins with the bridge crane, the crane way extends four bays beyond the tunnel, which limits the clinker storage area on the west.



Alongside the No. 2 kiln

Gypsum, purchased from the local plant of the Standard Gypsum Co., is dumped from 5-ton motor trucks into the clinker storage area, and is fed to the finish mill feed by the Milwaukee crane.

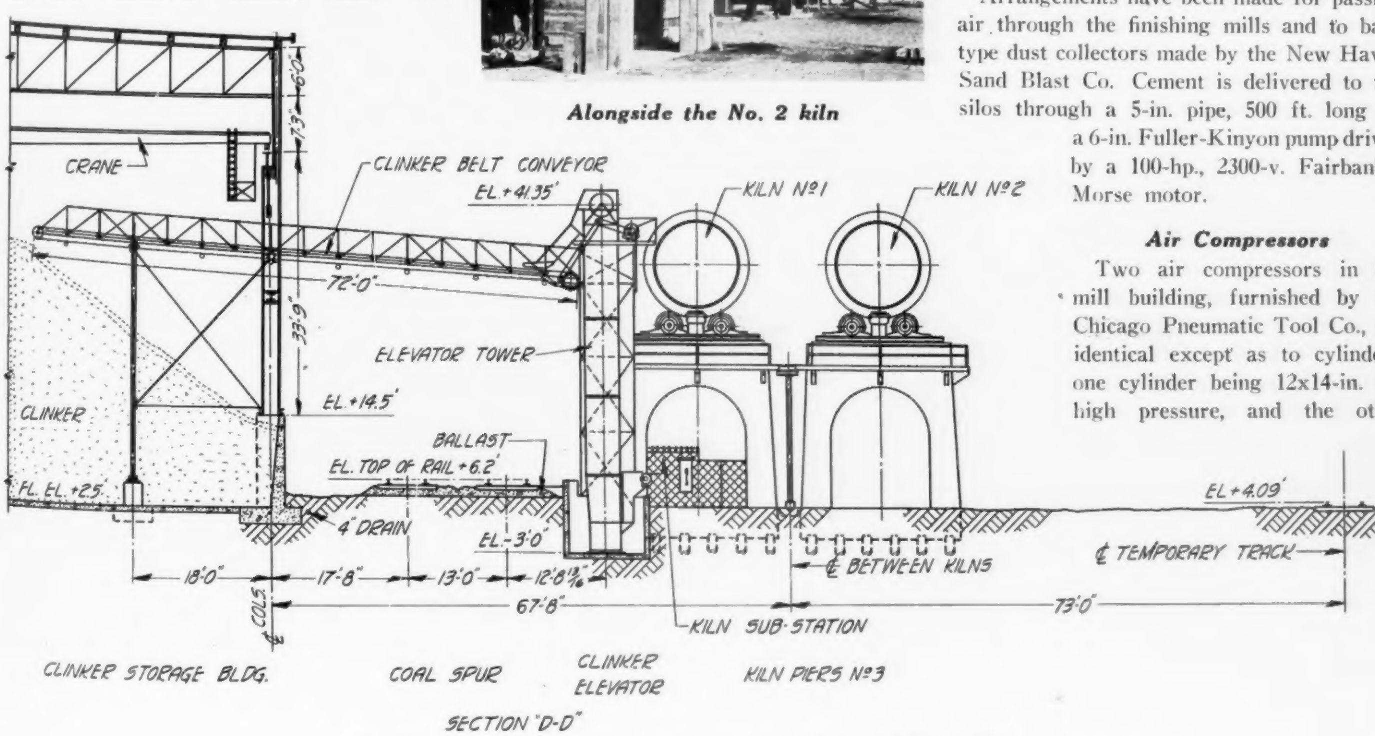
Clinker Grinding Department

The finishing mills are identical with the raw grinding mills, in fact, one mill is convertible, being provided with means for receiving limestone or clinker through a Schaffer poidometer, and clay slip through a Traylor ferris-wheel feeder, or gypsum through a Stevenson gypsum feeder, and also with means for delivering its output to the slurry conveyor or to the cement conveyor.

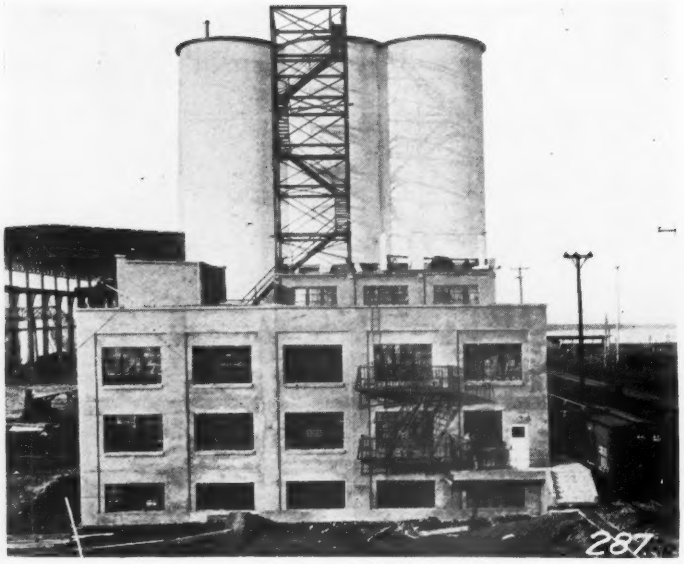
Arrangements have been made for passing air through the finishing mills and to bag-type dust collectors made by the New Haven Sand Blast Co. Cement is delivered to the silos through a 5-in. pipe, 500 ft. long by a 6-in. Fuller-Kinyon pump driven by a 100-hp., 2300-v. Fairbanks-Morse motor.

Air Compressors

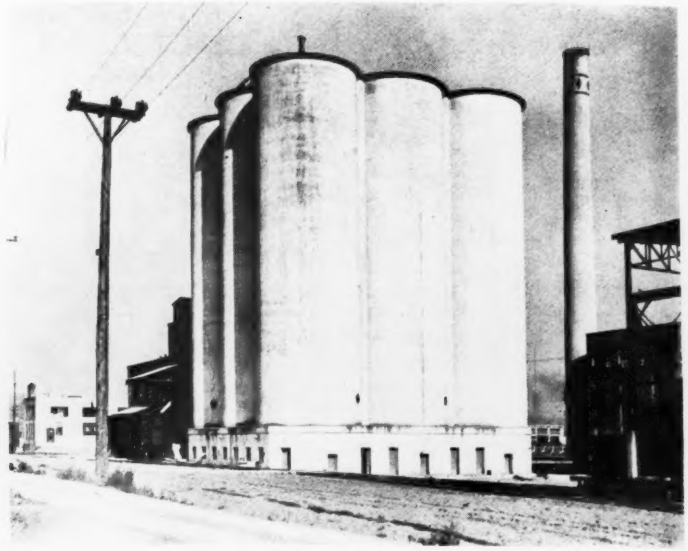
Two air compressors in the mill building, furnished by the Chicago Pneumatic Tool Co., are identical except as to cylinders, one cylinder being 12x14-in. for high pressure, and the other



Section through the clinker storage building and kiln structure



Pack house and storage silos as seen from laboratory building



Battery of finished cement storage silos

12x20-in. for low pressure. The former serves the Fuller-Kinyon system, and the latter the Dorr slurry mixers. Later both will be used for low pressure service, and new high pressure compressors will be installed elsewhere.

The compressors are driven by Fairbanks-Morse 100-hp., 2300-v. motors, through short-belt drives.

Silos

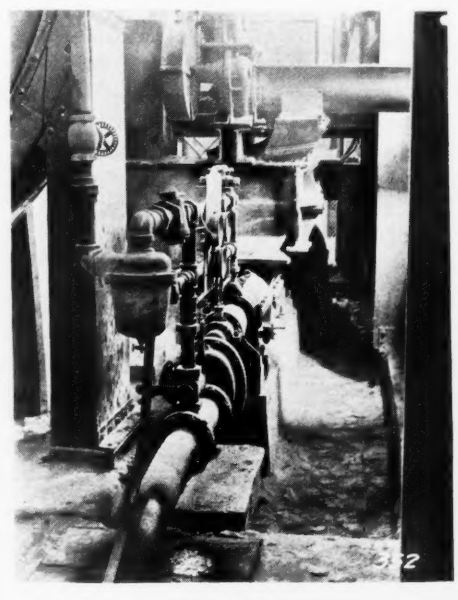
The silos, nine in number, are 24 ft. in diameter and 85 ft. deep. They rest on a 20-in. slab, over a 10-ft. basement, under which is a 45-in. slab carried on 937 piles 44 ft. long.

Three lines of screw conveyors, in concrete troughs on the basement floor, receive cement through 89 steel chutes, nine in each silo and two in each star-bin, and deliver it to two cross conveyors in the basement of the adjoining bag house. Numerous connections for compressed air were made to permit the agitation of cement in the silos near the draw gates. The piles under this and other heavy foundations were driven by the Puget Sound Bridge and Dredging Co. The silos were built, according to its own designs, by the Macdonald Engineering Co., which also built the slurry tanks and the wash mill setting from the owner's designs.

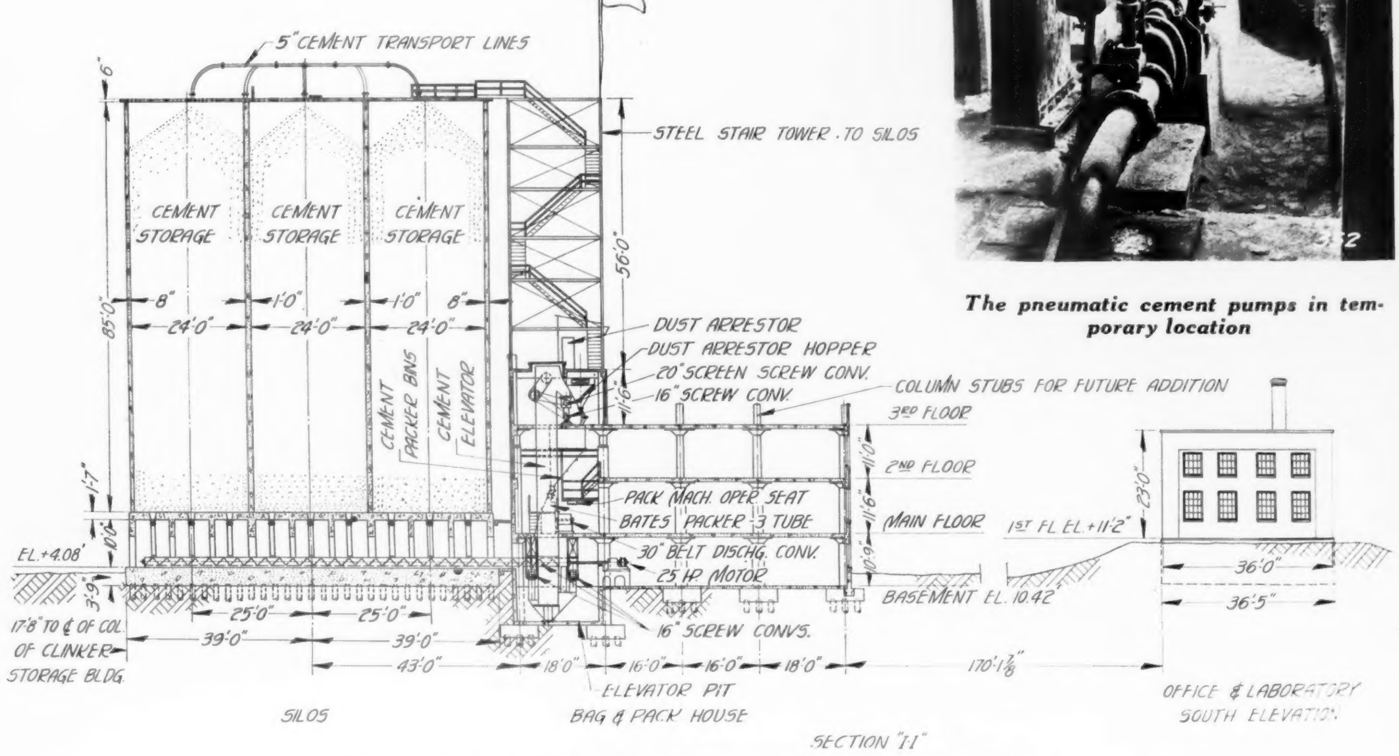
Ready-mixed concrete, furnished by the Pioneer Sand and Gravel Co. from its Harbor Island yard a half mile from the plant, was used, not only in the massive slabs but also in the silo walls on which pouring was continuous day and night for eight days without interruption in deliveries.

Bag House

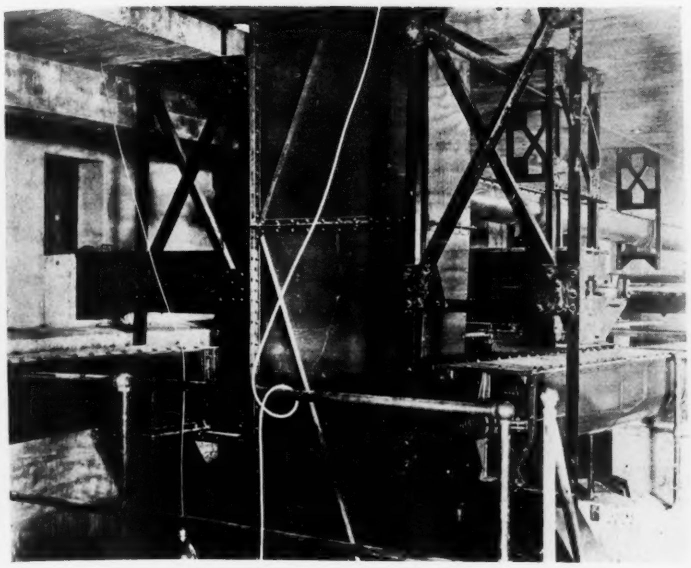
The bag house and pack house are combined in one reinforced-concrete building



The pneumatic cement pumps in temporary location



Cross-section and elevation of silos, pack house and laboratory



Screw conveyor and elevators in stock house basement

about 78 ft. square, adjoining the silos on the east, and consisting of two stories and basement, but designed to include a third story if that should be found necessary.

Along the north side of the building is a 7-ft. platform at the level of box car floors, and covered by a marquee. Over this platform, returned sacks are received, and filled sacks are loaded.

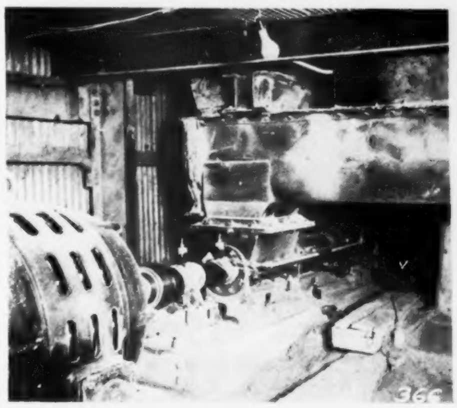
Two Bates three-tube baggers, with the conventional arrangements of conveyors, bins, platforms, etc., stand along the west wall and just inside of the building. The car-loading bag conveyor is a modification of the design recommended by the Bates Valve Bag Co., some additional provisions having been made for minimizing dust nuisances, and the conveyor being on wheels so that it can discharge sacks either at the door of the building or inside the car being loaded.

Facilities for loading bulk cement into railway cars are provided in the present installation, and the design includes a special pack house for loading trucks.

Penthouses on the roof cover the motor, controls, and hoisting gear of the Otis push-button-controlled freight elevator, and the elevator head and screw conveyors supplying cement to the packer bins. An easy stairway, supported by a steel structure on the baghouse roof, gives access to the roof of the silos.

The plant is built on tide flats which have been filled with fine sand dredged from the Duwamish River. Wash borings show only sand and gravel to a depth in excess of 100 ft.

All heavy foundations, for both buildings and machinery, are carried on piles. Two standard lengths were chosen, 36 ft. and 42 ft., and spacings and numbers of piles were adjusted to the characters and magnitudes of the loads to be supported on various pile groups. Foundation piles were

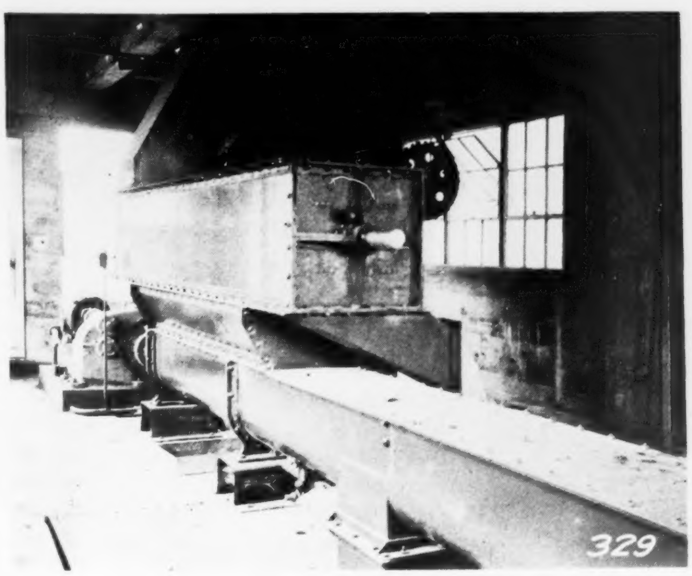


Motor drive and screw conveyor-feeder of the pneumatic cement pump

Basement of stock house; the draw gates at the ceiling feed cement through the steel chutes to the screw conveyor below

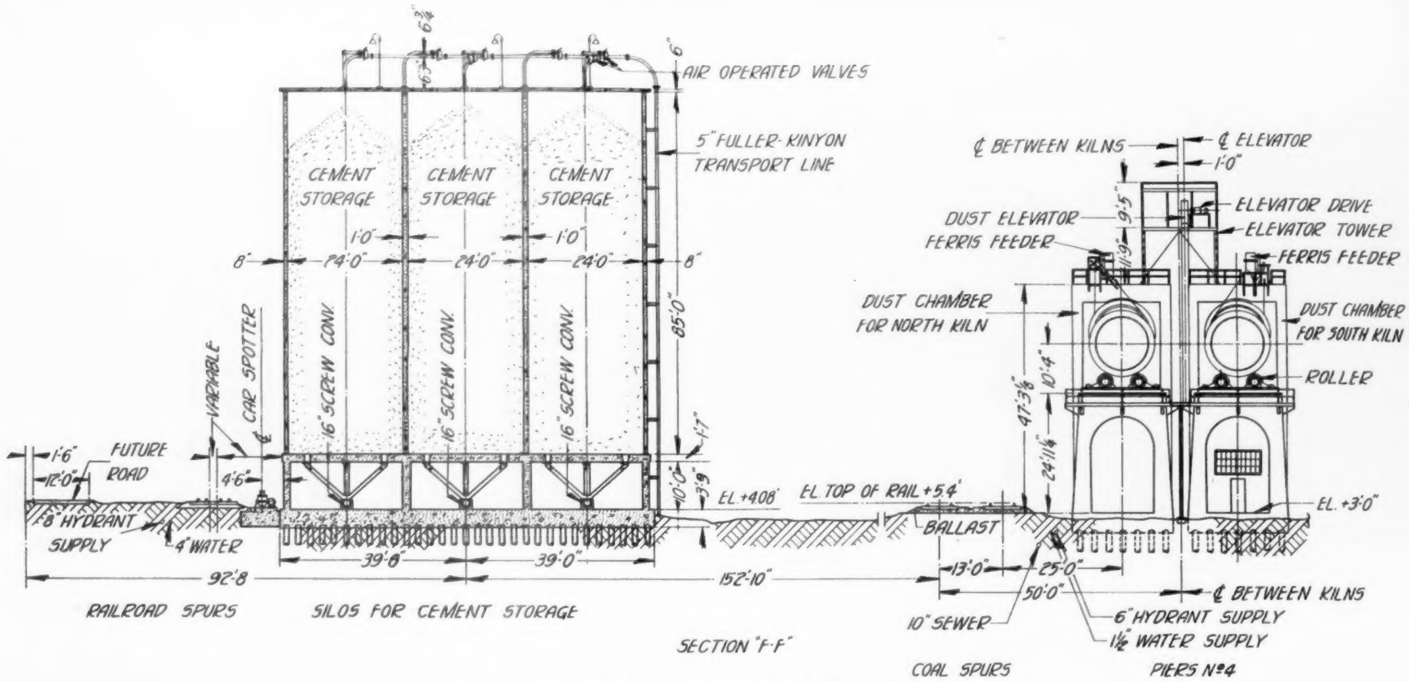
driven with a steam driver by the Puget Sound Bridge and Dredging Co. They were jetted to depths only 8 to 10 ft. less than their total penetration, and the load carrying capacities of nearly all piles were determined.

The foundations are of reinforced concrete, placed by Peder Gjarda, using ready-

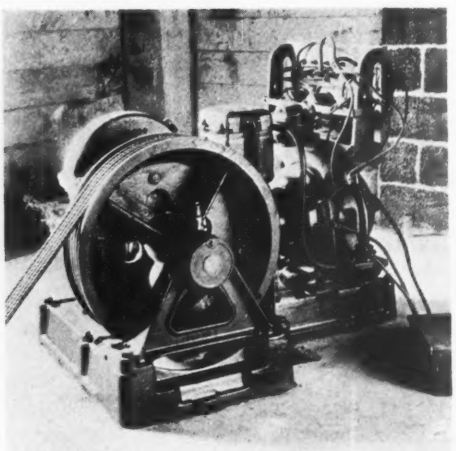


Screw conveyors over the packing bins

One of the conveyor drives in the pack house



Cross-section and elevation of finished cement storage



Motor and hoist for freight elevator in the pack house

mixed concrete furnished by the Pioneer Sand and Gravel Co.

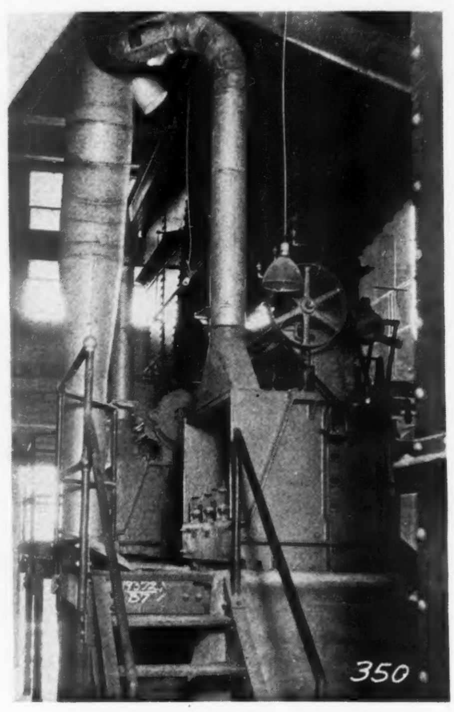
A variety of building details is to be found in the plant, for the reason that building design was subordinated to construction and operating considerations. Utility and low cost were primary considerations, but the buildings are substantial and they present a creditable appearance.

Above the concrete basement and the first floor, the office and laboratory building is of mill-type timber construction, with laminated second floor and roof, and stuccoed exterior. The design is suited to quick construction at low cost, and will make any necessary future interior changes easy and inexpensive.

The bag and pack house and the stock house are of heavy reinforced-concrete construction. The clinker storage and mill buildings have concrete foundations and walls, steel columns and trusses, and wood roofs. The firing floor and coal building consists of heavy reinforced-concrete main floors, supported on concrete columns, and surmounted by light steel frames with laminated wood roofs and "Transite" exterior walls. Johns-Manville roofs and Truscon steel sash are used throughout the plant.

Electrical Equipment

Either of two 26,000-v., 3-phase lines delivers energy to a bank of transformers owned by the Seattle City Lighting Department and located on the cement company's property. The entire present requirements of the plant are taken at 2400-v. through

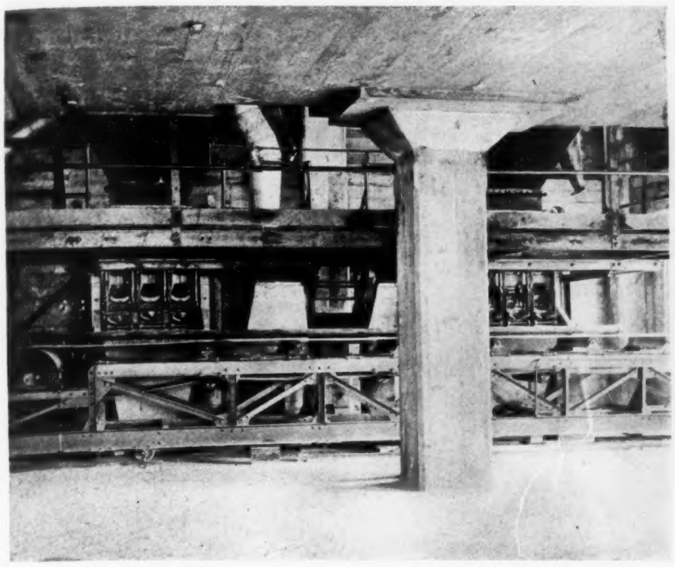


Dust collection pipes back of the baggers

a main panel in the switchboard, located on the mezzanine floor in the mill building. On that panel, in addition to indicating instruments, are the curve drawing meter of the Lighting Department, and a watt-hour meter and a General Electric recording demand meter belonging to the cement company.

Bag tying machine

The dead front steel switchboard was built in the Seattle shops of the Westinghouse Electric and Manufacturing Co. To the right of the main panel are, in order, the auto-transformer panel, three panels for controlling the three 750-hp., G. E., supersynchronous mill motors, and two panels for motor-generator exciter sets. To the left are five feeder panels for supplying energy at 2400 v. to large motors and to



Three-spout packers and bag conveyor mounted on wheels so sacks can discharge at cars or inside the building

Sack loader mounted on wheels for withdrawal into pack house. Note the hopper collector for dust from belt or sacks

transformer banks, which step it down to 440 v.

All 440-v. motors in and near the mill building are on circuits run out from a dead-front Westinghouse distributing cabinet located west of the main switchboard. Similar, but smaller, cabinets are used on the firing floor, one along the north wall in connection with kiln No. 1, and its fan, coal feeder, cooler, and slurry feeder, and the clinker elevator and conveyor; and one along the south wall in connection with kiln No. 2 and its accessories, and the future spare fan and coal feeder.

Motors are, with rare exceptions, fitted with ball bearings, and include machines made by General Electric, Westinghouse, Fairbanks-Morse, and Allis-Chalmers companies, all of which have excellent service facilities in Seattle.

The Laboratory

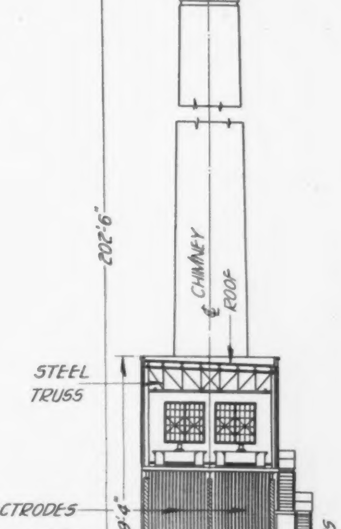
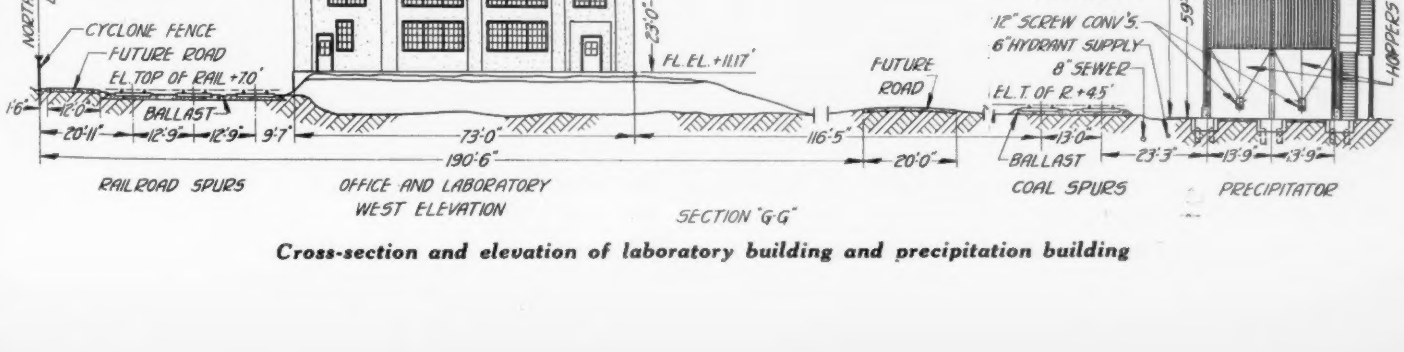
The laboratory occupies the greater part of the first floor and basement of the office and laboratory building. It includes, on the first floor, a sampling room equipped with hot plates, thermostatically controlled drying oven, and motor driven crusher, grinder, rolls, mortar, ball mill, and mixer; a physical laboratory with the conventional equipment for making screen, pat, and briquet tests; a chemical laboratory equipped for cement plant routine work, for coal analyses for the Pacific Coast Coal Co., as well as the cement company, and for research work; a balance room, and an office. In addition to steam radiators, electric heaters are provided for the close control of temperature in mild weather. Artificial ventilation is taken care of through a hood exhausted by a motor-driven fan on the roof.

In the basement are racks for the storing of samples, space for general storage, and a room for the storage of test briquets and cylinders in a saturated atmosphere at a temperature of 70 deg. F., maintained automatically by thermostats, mercoid switches, electric heaters, water sprays, and circulating fans.

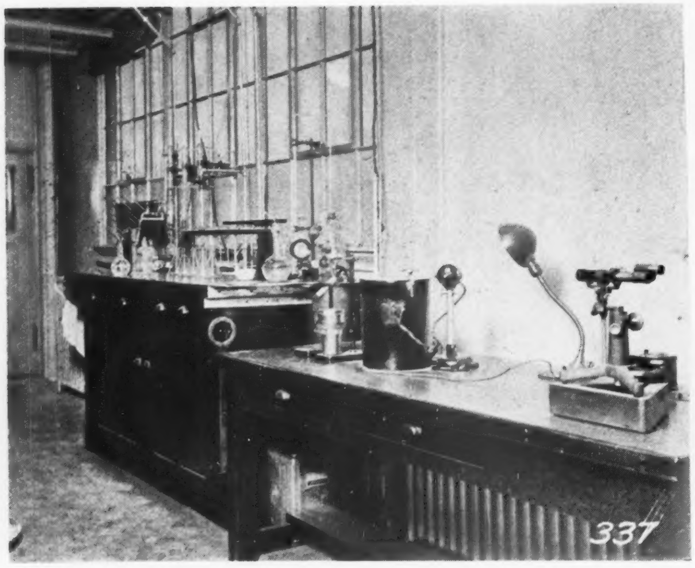
The laboratory was developed from the coal laboratory maintained by the Pacific Coast Coal Co., and used, as occasions required it, for research work by the Pacific Coast Co.

Early in 1926, N. H. Nelson, chemical engineer, was engaged to take charge of the laboratory investigation of raw materials. and a little later, W. R. Chandler, chemist, was added to the staff. Special, wholesale methods and equipment were developed for making the desired analyses of limestone and clay samples, thousands of which were run. Later, a small rotary kiln was designed and built, and many grades of cement, from normal portland to some showing ordinary 28-day strength in 24 hours, were made from combinations of the raw materials available.

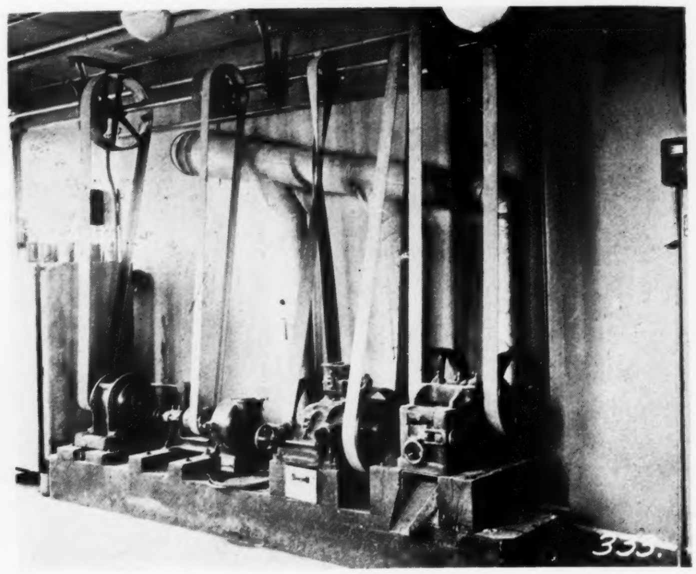
The tasks of the laboratory staff included, during the first two and a half years, not only routine laboratory work, but, also, the examination of every procurable article published on cement technology, and the more important material on concrete technology. Matters of probable significance to the en-

Cross-section and elevation of laboratory building and precipitation building



Coal analyzing equipment in the laboratory



Portion of the sampling room

terprise were made subject to laboratory investigation.

Plant Layout

The plant layout was determined by four things: (1) The size and shape of the plant site and the shipping connections to be made with it, (2) the storing, handling and processing of materials to be done, (3) the necessary plant equipment to be accommodated, and (4) the provisions to be made for expansion or improvement by means of equipment of any size or kind that may be developed in the future.

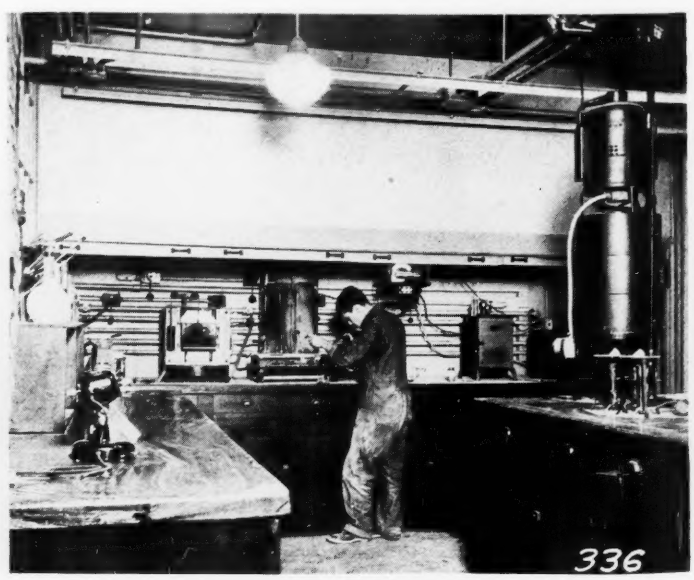
Matters of primary importance were those of receiving water-borne rock, of discharging it from the ship, of storing the maximum stock required at any time within the life of the plant, and of moving rock from storage to mill hoppers, for these things must determine, to a very great extent, the layout of the plant.

Rates at which rock would be used were tabulated for various plant capacities, taking into account the cement delivery schedules of the territory for recent years. The preferred size of ship having been determined by a very thorough study of costs, the maximum stock of crushing rock ever likely to accumulate at the plant was found. That, with a margin for safety, fixed the capacity of the rock storage yard.

The rock handling system adopted was one of a very great number of schemes investigated, taking into account the total of all costs incurred in moving rock from the quarry face at Dall Island to the mill bins in the plant in Seattle, including such diverse items as ship costs, marine insurance, lay time, wharf costs, and the costs of storing rock and of recovering it from storage. Self-unloading ships are not suited to the service owing to their high first costs, the high marine insurance rate on them, the long haul, the dearth of business for them, the absence of any satisfactory substitute for them in a system designed to use them, and the consequent hardships that would result to the enterprise from the loss of such a ship.

The only satisfactory scheme found for discharging bulk cargoes from ships and handling crushed rock in the yard at low cost was one based on the combination of a hopper and a belt conveyor with a hammerhead crane, an arrangement not known to have been made previously. Using this new combination of successful devices, and adhering to dimensions and capacities already in actual use in some service, a satisfactory rock unloading, storing and handling system was worked out. This fixed the position and size of the wharf, and established the centerline of the crane track through the middle of the storage area as the line about which the plant layout was made.

Cement loading tracks, and roadway and track leading to the clay department and the wharf naturally fell into positions parallel to the Milwaukee railroad tracks which



Physical and chemical testing laboratory sections at the Pacific Coast Cement Co. plant

bound the site on the north. The track for loaded coal cars found a rational location between the rails of the hammerhead crane track through the rock storage area. The packhouse location was, properly, near the middle of the cement car tracks, and present and future silo locations were fixed near it. Present and future kiln locations fitted in best on the south side of the coal track and the clinker storage building on the north

Left, W. C. Stevenson, and right, Maj. S. E. Hutton

side, leaving to the east of it, and on the south side of the baghouse, a suitable location for a truck loading plant. An open space remains north of the clinker storage building, into which the mill building can be extended from the west and new silos from the east.

The Development of the Project

Technical and economic investigations were made by the research staff of the Pacific Coast Co., assisted by the specialists employed by its various subsidiaries. Findings were reviewed by various consultants engaged for the purpose. Reports, on which the financing of the project was based, were made by Arthur E. Wells, consulting engineer of New York, and by the Cowham Engineering Co. of Chicago.

The plant was designed by S. E. Hutton, research engineer of the Pacific Coast Co., and was constructed by the Pacific Coast Engineering Co. as general contractor, with S. E. Hutton in charge as chief engineer of the project, and with W. C. Stevenson as engineer in charge of field work.

Personnel

Officers of the Pacific Coast Co., connected with the administration of the affairs of the Pacific Coast Cement Co., are Walter Barnum, president; E. C. Ward, vice-president and general manager; N. D. Moore, vice-president in charge of operations; H. M. Watkins, general auditor; S. E. Hutton, research engineer, and Carl English, purchasing agent.

W. H. Green is plant manager for the Pacific Coast Cement Co., Darwin Meisnest is assistant sales manager, N. H. Nelson, chemical engineer; E. H. Sirman, chief electrician and master mechanic, and John Bratchi, foreman. D. C. McDonald is superintendent at the quarry.

Cement Making at Dover, England

IT HAS been known for some time past in Dover and the surrounding districts that negotiations have been in progress between the Tilmanstone Colliery (the newest British coal field situated in Kent in the most beautiful part of England, and far away from the majority of collieries) and the Dover Harbor Board in connection with a site for the proposed cement works, which are to be erected by the colliery company.

An extensive area was decided on at the Dover Dockyard, which lies to the extreme east of Dover Bay, where also are located (on what is known as the Eastern Arm of the Harbor) the discharging bunkers of the aerial tramway from the colliery. The negotiations between the two bodies concerned have been prolonged, owing, no doubt, to the importance of the interests involved, but it is now possible to state that the new works will probably be started earlier than had been anticipated.

The three essentials for the manufacture of cement—chalk, clay and coal—are all under the control of the colliery company, and it is claimed they are accessible and in close proximity to each other. Chalk is the most suitable source of lime cement manufacture, and the two most important deposits of chalk in the world are those located on the south coast of England and the opposite coast of France.

Multi-walled paper sacks are used to ship cement

The best clay for cement is that known as "gault" clay, which is found in close association with the chalk deposits on the English south coast. It is claimed that Kent coal is very suitable for cement making because of its high calorific value and the ease and cheapness with which it can be pulverized.

The erection of a large cement plant would undoubtedly have a beneficial effect on the present condition of Dover, which, since the war, has been passing through an extremely difficult period, though local labor conditions, according to the official unemployment figures, have been gradually improving.

Officers of the Pacific Coast Co. and subsidiaries

Winter Thoughts of an Aggregate Salesman

A Discussion of the Groundwork Principles of a Comprehensive Plan for Promoting the Use of and Selling Concrete Aggregates

By Stanley M. Hands, C. E.
Junior Testing Engineer, Division of Highways, State of California

EVERY BUSINESS that exists long enough acquires traditions. Whether these are worthy or not depends upon the ability of the management to weed out the undesirable and improve those that are desirable.

An examination of the time-honored practices of the concrete aggregate industry reveals certain detrimental precedents. This undesirable condition is not immutable, but care should be exercised to insure changes in the right direction. It is advisable that those who are responsible for the management of sales and market promotions should be familiar with certain fundamentals which govern the control and use of aggregates. Resourcefulness to create something new serves best after comprehensive planning has established that improvement will be progressive and permanent. A failure to reject unworthy practices and precedent will obscure the purpose of the plans. This demoralizes the organization, whereas talent, intelligently directed, acts as a stimulus and something is gained permanently for the industry.

Concrete can be and is made from clean pit-run materials. This was done in the construction of the Pardee dam by the Atkinson Construction Co. Furthermore, as in that case, it may be the most economical way to make concrete. Trial batches indicate and experience may prove. Standard proportions and grading are only practical in so far as they are effective in giving uniform quality of concrete. Since good concrete can be made from pit-run materials, it is suggested that the minds of the engineer and producer shall meet to determine the most economical grading and proportions. Greater mutual benefits should accrue to each than would be the case where either disregards the other. The engineer is and should be the leader, but his mind should not be confused or clogged up with concrete any more than with design. Each should be clearly understood by him and he should extend the same courtesy to the aggregate producer as is employed in dealing with other material producers.

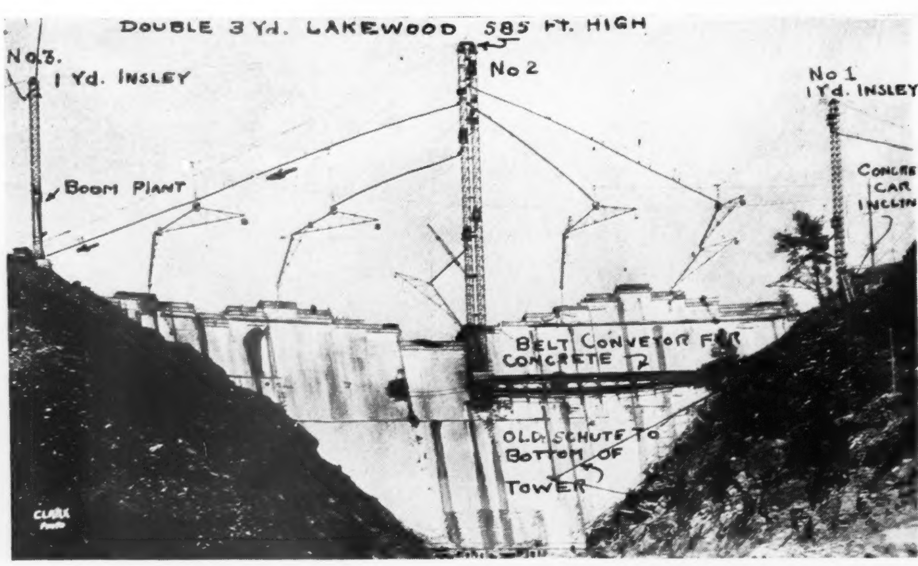
Too Much Stress on Saving Cement

Too many engineers are inclined to think of aggregates as a low-priced commodity, the price of which does not affect the price of concrete to any great extent. Since the variations in the price of aggregates are but a small percentage of the total cost of the combined materials, emphasis is placed upon saving the higher priced ingredient, cement. The tendency is to extend the practice of saving cement. Too much emphasis has been placed upon this factor in economy, thereby influencing the selection of aggregates with very rigid grading limits which are difficult to process in the making and in use. Low costs and uniformly good quality concrete do not go together.

The aggregate industry is justly proud of its ability to meet changing conditions of service, even though it may not be proud of its profit-making history. Development in concrete engineering has increased the rigidness of the specifications. Commercial producers now make aggregates with uniform characteristics which do give good uniform results without elaborate design and control methods; and it is only fair that they should be paid for this service. If changes can be made to utilize more of the materials which are handled in the harvesting and processing of aggregates such changes should be made. Lower costs of production mean better profits and better service, whereas waste of any materials increases costs and eliminates a desirable source of supply and competition. The engineer will protect his costs by encouraging capital to enter the aggregate business but he must remember that the only excuse for business is profit.

Looking for the "Secondary" Market

There are producers, particularly those having crushing operations, who are not producing much unsalable material. Certain limestone quarries dispose of undesirable concrete aggregates as roadstone or by further grinding as agricultural limestone or filler. On the other hand, certain inherent difficulties exist in crushing operations which are not to be overlooked. Round particles fit together to give greater density than do the irregular crushed fragments. Therefore crushed-stone aggregates give a greater percentage of voids. Certain design methods which are based on void content make crushed stone uneconomical. The additional care required to prepare crushed stone to give minimum voids may result in increased costs to offset the advantage of secondary markets. If orders for concrete aggregate of this type equal the plant capacity and secondary markets are sacrificed, the operation may show a loss. Careful costs should be kept to insure the relative importance of markets.



Pardee dam: 3800 cu. yd. of concrete in one day and 68,000 cu. yd. in one month is the world's record for placing made on this 615,000-cu. yd. mass of concrete. The concrete distribution system is partially outlined against the sky. Double 60-ft. counterbalances with "elephant trunk" served by 1300 lineal feet of 42-in. belt conveyor, center tower and overhead chute lines, 20 in. wide and lined with rubber. Designed concrete used here. See ROCK PRODUCTS, September 14, 1929

The lower priced product may be making the profits. Secondary markets are an advantage and every effort should be made to protect them. One pleasant experience showed that crusher-run road stone at $1 per ton made more profit than concrete aggregate at $1.45 per ton besides offering an opportunity to clean up the quarry.

A Case of Give and Take

When the crushed material is trap or igneous rock the problem of secondary markets may not be so easily solved. While good concrete can be made from these hard rocks the best markets are the black-top pavements. Specifications for material to be used in black-top pavements are becoming more exacting. Oil and asphaltic road mixtures require great care to secure and retain permanently a smooth riding surface. Little variation in the binding fluid is allowed and stability is secured by careful grading and proportioning of aggregates. Operators in hard rock cannot expect the tolerance in the specifications for black-top pavements that can be allowed in cement concrete pavements, but they can be assured of a preference for broken aggregates. These help to secure stability.

Although the hard crushed rocks have certain advantages over the gravels in black-top pavements, the position may be reversed in cement concrete pavements if the sand-void method of proportions is used. Engineers should be sure when this method is required, for it involves considerable testing and calculating to give results and errors easily result. The gravel producer will find it unwise to encourage the method for he must keep in mind that unless he has an ideal deposit he will be forced to waste or find other markets for a considerable amount of sizes which cannot be used in making up the blend of sizes to give a maximum density. Since certain sizes which are generally found in the pit have no great use in themselves it is probably true that the wiser course to pursue would be to join with the crushed-stone producer to encourage the use of other and more desirable methods of designing concrete mixtures. The mutual benefit is that the crushed-stone producer does not have to worry about his increased voids and the gravel producer does not have to worry about his increased stocks of unsalable sizes. This last is actually waste.

When Does a Stockpile Become a Waste Pile?

It is a difficult matter to tell just when a waste pile is merchandise and even more complicated is the determination of when and how a stock pile becomes a waste pile. Herein lies considerable danger to the financial structure of a business. Money is often advanced on stocks of merchandise. This is entirely proper and should be encouraged. If the material is being "turned over" throughout the season and is acceptable for use there is no danger perhaps, but if material is accumulating and not moving it is necessary that it be protected against silting, weathering and segregation. The depreciation of stock piles is considerable and this must be considered when material is to be hypothecated.

These surplus stocks should never be dumped upon the market. It is quite a temptation to raise money by unloading at a low price, but such practice in any business has been found to be detrimental. This is especially true when it is proposed that changes be made in methods for utilizing these materials as standard products. Surplus stocks of aggregates are those which do not move readily because special provisions are required to permit their use. If they are dumped they are admittedly inferior materials, at least according to accepted standards. It would be better to state their characteristics and ask that the proportions be made to fit. When attempts are made to use these materials without notice the engineer or architect finds his routine upset and uncertainty enters to aggravate him. His reaction is to tighten up not only in inspection of materials but in concrete practice. The producer and his customer suffer thereby and it is hardly necessary to follow through to find where the "break lands." It bounces back. The dumper is dumped.

Concrete Practices Can Be Controlled

The engineer's position permits him to be most exacting. Engineering research in concrete suggests a number of alternate methods of design and control. One or two bad experiences with material by the engineer is too many for the aggregate producer. Concrete practice should be controlled by ternary decisions, but the producer and the contractor may encourage monarchial conclusions. If the procedure is to be fair the producer should understand the underlying principles of concrete. With this fundamental information he can proceed to secure modifications of the undesirable provisions of the specifications. Contractors' preference should not be disregarded. His is the responsibility of using the materials.

Local conditions will govern the nature of the alterations. If concrete practice produces strengths that range over wide limits it is probably due to the method of design. The engineer should study his mixes to see that he is getting foolproof mixtures. Since these mixtures allow considerable range in the proportions of fine to coarse aggregates the producer can select that which is best for his particular operation. An operation which is wasting a large percentage of the raw materials because of strict grading requirements will want to change these to permit the sale of a greater amount of the pit material. If these sizes could be sold it should lower the costs of production. When proportions are changed to permit the use of greater amounts of intermediate sizes there will be an increase in voids which must be filled with cement and water. That is, this is true if the original gradation curve gave the greatest density. Gradation therefore is a matter of economy in cement. The producer must be prepared to make his new price level lower to absorb the increase in cement. It may be that for his particular material the strength can be realized without any increase in cement.

The water-cement ratio curve varies with the materials. For some aggregates the curve is higher than Abram's curve and for other materials it may be lower. The same effect is noticed for different cements. The aggregate showing the lower curve with one brand of cement may show a higher position with another brand and conversely the higher curve may be lowered by using another brand of cement. To correct for this condition engineers have come to use the trial method of proportions. By so doing the responsibility for the most economical proportions is carried jointly by the aggregate and the cement. The trial method is not so involved, and the simplicity with which concrete can be made and controlled recommends this method to every one's attention. There is this objection to it for highway work: that the necessary information as to quantities may not be available to all bidders, but it certainly does permit of the use of all the factors which enter into concrete strength calculations. The same cannot be said for arbitrary proportions and grading requirements.

Effects of Gradation Changes

Changes in gradation do not affect the strength except when the amount of cement is fixed. When cement yield is specified there can be no change in any other factor without changing the proportions if the same strength is desired. The pretty picture which is painted depicting all factors fixed and unchangeable is terribly blemished and in many cases mutilated by field practice. If exact detail as to sizes is expected and assumed as practicable in planning control routine, some one is going to be disappointed. These changes do occur and, since yield is maintained the changes which follow in other factors give a variation in strengths. If the cement content is not fixed until the trials have established proportions in which changes in factors are not important, uniform strengths can be secured by water control. For any other proportions it is advisable to buy two or three materials, each having a very limited range in sizes, and these are put together on the job to give the intimate blend which is required for minimum void mixtures. It is only fair, however, that the costs involved in such practice be charged against the cement since the saving of cement is the intention of the designer of the proportions. When this is done it is

found that it is cheaper to use more cement and less grading.

Engineer Should Define Limits of Aggregates

Since the producer is not in a position to accept the responsibility for all the factors affecting the strength and other desirable qualities of concrete, the engineer should define the limits of the aggregates. A practical tolerance should be allowed for gradation. The specifications should state the limits of sizes, but these should not be too exacting. The requirements for grading should allow for changes due to segregation and proportions should be selected which are not affected greatly by a small variation in grading. If aggregates are uniformly graded this should be sufficient. Uniformity of grading characteristics is best realized with aggregates that do not show the minimum voids. The difference, however, is not great and the inherent ability of certain screen sizes to stay together is a big advantage. Uniform materials lend themselves to securing uniform strengths particularly in the higher strengths. These higher strengths permit of economy in construction that makes the little saving in cement insignificent.

Uniformly high strengths are only possible with workable, non-segregating and controllable mixtures. Of these there are but a few and for all practical purposes they need not be figured to hundredths. There are some engineers who recognize the limited number of practical proportions and have established rules to permit the use of materials as determined by their characteristics. These engineers are having little difficulty in controlling these mixes. However, there are a lot of engineers who refuse to accept the simplicity of these mixes. Such words as "concrete engineer," "concrete physics" and "concrete technologists" have been coined to lend dignity to an inspector, but the fact remains that a lot of good concrete is being made by men who have never known anything but a 1:2½:5 mix. The concrete art demands simplicity and is going to have it.

The minimum void-minimum sand theory is all right in the laboratory, but in the field such proportions result in mixes that are not susceptible of control because none of the present-day instruments for measuring the factors will detect changes in these factors well enough to permit correction. If large changes in factors are necessary before the changes are apparent, or measurable, there cannot be any control to give uniform strengths. All refinements in materials are wasted. Furthermore, the strength relationship cannot be assured because of faulty fabrication. Economical design of structures does not mean the most economical design of concrete mixtures, but rather it necessitates the design of a mix in which the materials are put together in such proportion that the concrete is sensitive to variations in its factors and these changes are measurable with control instruments. Cement and sand are two ingredients which contribute most

Coarse aggregate in this mix was blended from No. 1 and No. 2 gravel to give 34% voids. Sand was added in amounts to make 30% of the combined aggregates. The mix as it appeared in the mixer bucket (right)

The concrete mixture placed; once over with the finisher. Rock pockets are being broken up by the mucker

Rock accumulations all raked down on to the sub-grade ready for the next batch

The next batch in the bucket

Batch dumped by mixer bucket washes into place

to make controllable mixes. After control is secured the engineer can proceed to design for higher strengths and economize in greater detail. Concrete mixtures should not be those that must be handled with kid gloves.

It is not intended that the costs of concrete should be disregarded. It is intended that the cost of concrete should be considered in its entirety. These costs include materials, labor and tools for testing, measuring, transporting, mixing, placing, finishing and curing. The selection and effectiveness of these depends upon the degree of workability secured by the proportions. Those mixes which are controllable also respond most readily to tools and labor. Production can be increased correspondingly. Increasing production decreases costs. Actual experience has shown that workable concrete lowers costs amply to absorb any increase in cement that is required. Workable concrete is the most economical concrete.

Workable concrete is likewise the best concrete. Harsh concrete is not good concrete. Proportions which result in harsh concrete should be redesigned. Additional water will only aggravate matters. Water lowers the strength and encourages segregation. Accumulation of water is more serious than is generally appreciated. Beside lowering the strength the water decreases imperviousness and increases shrinkage, which result in uneven surfaces in pavements and internal stresses due to changes in volume. Every known law of concrete is premised by the condition of workability. Therefore the essential standard to measure every desirable quality of concrete is first that the proportions shall result in a workable mixture.

There is a theory of concrete mixtures which has been used at different periods and in various parts of the country that for a minimum amount of cement the maximum strength can be realized by proportioning aggregates which have been carefully graded to give a maximum solid volume or, the same thing, minimum voids. In these proportions the coarse aggregate is graded with limited tolerance from fine to large sizes. The larger the large size the less the percentage of intermediate sizes, which means that much less tolerance for intermediate grading. The trouble with this type of aggregate is that it increases the cost of production. The crushed-stone producer makes angular pieces of stone that do not lend themselves to low voids. He can not compete with the gravel. The gravel producer must waste a lot of his deposit since nature never laid down a natural scientifically graded aggregate. If these were all that suffered the engineer might be justified in using the mix, but he, too, suffers. The need for additional mortar and the inherent tendency to segregate if too little mortar is used upsets his calculations.

Slump Cone Useless as a Control Device

Proponents of this system of proportioning will not agree. Good concrete can be secured but at a needless expense. In most cases it is found that they have selected a mix which is loaded with trouble. These mixes are not controllable. Large increases in water are required to give a small increase in slump and since all kinds of slumps can be secured by standard methods, even in

Segregation beginning in front of the finisher

Segregation completed and muckers have pulled large rock to subgrade ready for next batch

the same batches, the slump cone becomes useless as a control device. Representative samples for tests are almost unobtainable. Field samples, when tested for strength, show a wide range of strengths due to the position of the large rocks or to the personal equation in making the sample. Results with these test specimens can be interpreted in too many ways, and cores taken from the concrete show a wide variation in strengths, density and effective depths. This is enough evidence to justify the claim that these mixes are no good. If everybody suffers, why persist in the application of the theory?

Proportions that are designed primarily to give workability are almost foolproof. They should be such that the slump curve is flat through the range of consistencies which are required for the work. When the proportions producing concrete showing this characteristic are used, a considerable change in consistency is secured with very slight change in water. Also any increase in water or any appreciable change in grading is indicated by the change in consistency and is therefore easily detected and located. The grading will not make much difference unless it is extremely out of line and therefore the grading is not important, except that it should be uniform. So long as the grading which was used as a basis for the design of the proportions was not exact as to voids a considerable change in intermediate sizes can occur without changing the voids. If, however, the grading must be maintained to give a minimum of voids, considerable difficulty will be experienced in maintaining the mix and these maybe defeat the purpose. When uniform and not exact grading is specified the grading is a factor which can be left to the producer of the aggregates.

Proportioning by weight is the best way to simplify control. Slight changes in grading to do not affect the yield, and the proportions are maintained as to solid content. Control at the weighing hoppers is secured with ordinarily intelligent labor. Corrections for moisture content are quickly and accurately made with the pycnometer and tables for correcting the aggregates and the amount of mixing water. A plant inspector can make the tests as indicated by visual inspection of the materials as they are delivered. When proportions are made by volume, the producer can be of great assistance if he will maintain stocks, as has been suggested. If uniformly damp or surface dry materials are delivered a few tests for bulking are required. The engineer should consider this advantage for regular commercial sources before he goes far in encouraging temporary or road-side set-ups.

The amount of mixing water and cement is predetermined. The important thing thereafter is that each should remain the same. In practice the water does change. If proper control devices are installed and inspected for leakage and the proportions are right this change in water is easily corrected. A definite limit, which allows for ample cement should be set and water should be below this limit. In this way the worst condition which can occur is to have the water approach this limit. If this limit is set at the amount slightly under that which will produce segregation uniform fabrication is insured.

So long as nothing better than the slump cone is available to measure consistency and control workability, the proportions should be those in which changes in factors are followed by large changes in slump. This permits the slump cone to be used to restrict and measure sensitively the changes in the other factors. Any other proportions will very likely result in too wide a range in strength to permit the fullest application and realization of the theory of using high predetermined strengths and other desirable qualities of concrete. Uniform strengths, shrinkage and density are advisable at all times and full consideration should be given to securing uniform results first. If successful control has been established, further refinements may be advisable to secure maximums and minimums.

Although it is here recommended that limits and tolerances for sizes should not be too exacting, the producer must not lose sight of his responsibility. The materials should be sound, clean, uniformly graded and uniformly wet or dry so far as is possible. A ton of aggregate must be something in addition to a ton of inert material. A good trade slogan might be, "Uniform materials, consistently made and consistently delivered." If the producer fails in this the entire structure of control practice as herein outlined fails, and the engineer or architect is confronted with the need of constant and expensive tests to insure the correctness of his proportions. This kind of supervision slows down concrete production and increases costs for the contractor. The producer need not fear to assume his obligation as the grading herein required is not exact as to sizes and he can rightfully suggest which grading he is best able to deliver. Also these proportions will permit the sale of considerably more fine aggregate than is usually marketed.

The next batch was worse—no shoveling was necessary to get the big rock on to the subgrade

There was plenty of "soup" to finish the surface because of surplus water. Slump shows about 1 in. because of big rock stability

Grading of Fine Aggregate

The grading of the fine aggregates is an important factor in foolproof mixtures. Sound, clean and well graded sand mortar in which coarse aggregates are secured during the concrete transportation and fabrication period is very desirable. The sand also acts as a retarder to the tendency for the water to flow. If the water is securely held in the position in which it is placed by the mixing operation the cement and other materials can not segregate. Quick placement,

uniform finish and strengths are assured. Uniformly graded sand can be protected from segregation by maintaining it uniformly damp in large stock piles. The sand should be de-watered before stocking or two piles should be maintained to permit delivery from one while the other is being de-watered. A producer will please his customer if he will provide ample de-watering facilities to insure a sufficient supply of uniformly damp sand.

There is considerable difference of opinion as to the proper amount of sand to be used in concrete. The argument is best left to the laboratory. Field experience indicates the need for sufficient sand to secure workability and every effort should be made to make the laboratory work helpful to field practice. The decision as to the amount of sand is best left to the practitioner. There are plenty of good engineers who are recognized in the field of research who are using as much as 50% sand by weight because they recognize that unless the mixes are workable under field conditions none of the theory holds good.

Proper Amounts of Sand

It is perfectly safe to assume for certain types of construction that there are ways to make concrete of good even quality, if the proportions provide for a sand content up to 75%. It is seldom necessary to use that much sand but it has been done. Tests made in advance of the beginning of the work using the proposed materials will indicate the consistency. The proportions which give this consistency should be one of the fool-proof group. The combined aggregates when tested on a No. 4 screen should show not less than 35%, nor more than 65%, retained. One-third of the combined materials passing a No. 4 screen is very little sand, and requires exact grading. Such proportions are in the class of mixes which are not easily controlled and which show a very marked lack of uniformity in strengths and shrinkage. More sand than this amount is preferable. Not only does it prevent segregation, but it permits of some variation in the grading characteristics of the aggregates. More sand than 35% is allowed in the specifications for concrete in the 1928 Joint Standard Building Code by Arthur R. Lord and in the Iowa State Highway Commission specifications for concrete paving and allied structures. These were prepared by Roy Crum and his associates. In these specifications six competitive mixes are provided which permit sand to be used up to 60%.

When the sand content is a minimum the segregation as shown by the pictures and the screen tests on washed samples defeats the purpose of design, even though high strengths are secured.

Core sample of the concrete made under conditions described

Low-Sanded Mixes

An idea of low sanded concrete can be had by studying the pictures with the graphs showing screen tests, on less than 35% sand mixtures. The *A* and *B* samples are taken from the same batch and although materials were delivered in two sizes and weighed out, segregation that followed resulted in variations of sizes within the batches which would not be permitted under the specifications. The following table, taken from the "Field Manual and Field Regulations" of the Iowa Highway Commission gives the weight proportions and corresponding proportions by absolute volume for a one bag batch of concrete:

Mix No.	Weight proportion	Proportion by absolute volume
1.	94—160.74—326.18	0.47975—0.97206—1.97254
2.	94—181.42—273.54	0.47975—1.09712—1.65421
3.	94—193.64—237.82	0.47975—1.17102—1.43820
4.	94—203.98—203.98	0.47975—1.23355—1.23355
5.	94—211.50—173.90	0.47975—1.27903—1.05164
6.	94—216.20—144.76	0.47975—1.30745—0.87542

These proportions are for materials with the following S.G.: Sand, 2.65; coarse aggregate, 2.55. Corrections are made for any appreciable variations from these.

The concrete made from these proportions will give the same strength. As the sand increases the cement increases, thereby maintaining a constant water-cement ratio. The sand grading is held uniform and with a very reasonable tolerance. The coarse aggregate is limited in the first mix to a maximum size of 1½ in. In all other mixes the coarse aggregate may be 2½ in. in the largest dimension.

These specifications contradict the proponents of mixes requiring the larger aggregates for the minimum cement, as is indicated by the provision that only in the first mix where nothing larger than 1½ in. aggregate is used is the least amount of cement used. If the 2½-in. stone is used the second mix containing more sand and more cement governs. The controlling factor in selecting such proportions was workability and easy control of concrete, wherein the water-cement ratio is held very uniform, because of the ease with which an increase in slump can be secured with a negligible amount of water.

Comparisons of concrete cores and field

The proportions of the concrete mix were said to be right until the cores were cut

samples made from these mixes with others made from proportions containing 30% sand are favorable to the above proportions. The concrete shows less range in strengths and greater uniformity in structure. The prices paid for concrete as provided and controlled by the quantities in the first three mixes is indicated by the preference which contractors show for the higher sand, higher cement mixes. This preference is of great assistance to producers in disposing of sizes and surplus sand. The stocks of each are balanced by shifting from one mix to another.

This is best explained by a comparison of the quantities in the first and third mixes. For this purpose a 7-bag batch is used. Each of the quantities in the weight proportions is multiplied by 7, which gives 1125.18 lb. of sand and 2383.26 lb. of coarse aggregate for the first mix and 1269.94 lb. of sand and 1914.78 lb. of coarse aggregate for the second mix. Each batch therefore that is mixed in the second mix requires 144.86 lb. of additional sand and decreases the amount of coarse aggregate by 468.48 lb. as compared with the first mix. Additional gains in tonnage are possible for the producer who has an excess of sand if he wishes to ship in the third mix proportions. Tables are furnished by the engineer of tests and materials which show the different amounts of sand, coarse aggregate and cement required to build a mile of standard concrete paving. These tables are approximate, but furnish a very accurate means of comparing the total costs of materials per mile for each job. These are used by the producer to assist in determining his price as indicated and determined by calculations covering competition, the condition of his delivery and the selection of the most advantageous proportion.

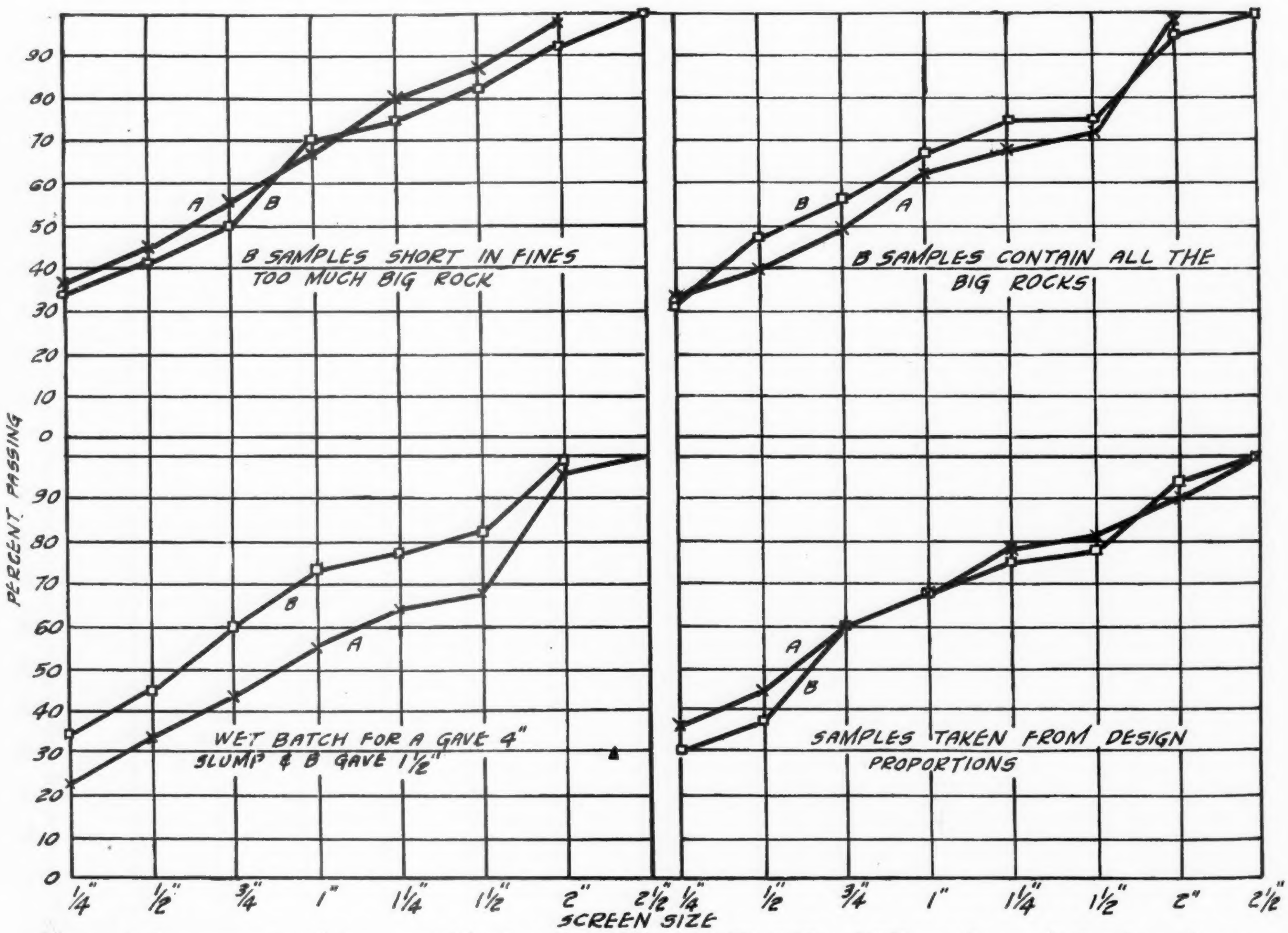
Worth of Grading Aggregates

These specifications have been in effect for several years, during which time approximately $100,000,000 has been expended in paving highways. The results have demonstrated that good concrete can be made from aggregates showing a wide range in sizes and grading characteristics. They recognize the effect of grading on the cement yield and also the effect of increased sand upon the quality of concrete. However, they have demonstrated also that grading has little or no effect upon the strength and other desirable qualities and is only important in that it influences the amount of cement and water required to give uniform strengths.

Too much importance therefore should not be placed upon the grading requirements. These rigid requirements restrict the producer and increase his costs. There is no need to increase his costs a dime just to save a nickel in cement. Especially since this theoretical saving may not be realized when measured in terms of concrete quality.

Cement-saving aggregates, if permitted to dominate the market, must carry the costs of harvesting, processing and wasting sizes that are rendered unusable by the specifications. When a considerable proportion of the raw materials becomes unsalable, it is time to secure modifications as indicated by the Iowa specifications, or to secure the approval of engineers for a system of designing mixtures as required by the grading of less expensive aggregates. The producer can then sell his materials at prices which influence the proportions to give the most economical materials. Lower costs will permit the absorption of the increase in cement.

Engineers should be encouraged to blend unsalable sizes to equalize the run of the pit with the market demand. This practice will not harm the engineer and it will assist the producer. A little charity in this way will go a long way toward getting home to the producer a few things that he may not



Screen tests on concrete mixtures containing less than 35% sand. The "A" and "B" samples were taken from the same batch, and though the materials were delivered in two sizes and weighed out, segregation that followed resulted in variations of sizes within the batches

suspect. Uniform materials are preferred above all others.

"Premium" Aggregates

The producer must be impressed with his responsibility. If the engineer and architect are to be asked to let down the bars to a certain extent they must be assured that material if not well graded will be uniformly graded. Considerable effort and expense is justified to secure uniformity. Therein is the secret of premium aggregates.

Edmund Shaw of the editorial staff of ROCK PRODUCTS summarizes the successful sales methods of the River Products Co. in ROCK PRODUCTS, July 7, 1928, as follows: "It is evident that the special quality which the product of this plant has is uniformity. It costs money, as every producer knows, to maintain a uniform grading in the product of a plant, but it is evident that the contractor who understands this is willing to pay for it."

Engineers and architects who prescribe the practice for the territory served by that plant insist upon products that can be controlled. They design the mixes to give proper consistency and to be workable with the tools at hand.

The contractor's problems are simplified thereby. He is permitted to organize and get production. This lowers his costs and increases the value of the aggregates which make it possible. Relations are not strained by undesirable shutdowns about the time he is "high-balling her through." On the other hand nothing offers a better excuse for tying up the job than uncontrollable variations in the quality of the concrete. These variations must never be charged against the aggregates, if producer service is to be capitalized. A cardinal virtue of a good sales plan is the quality of the service.

Knowledge of the product and the product's product is essential to successful sales promotion. Truthful criticism of practice which affect operations in making and using concrete aggregates is solicited by engineers and architects. The criticisms herein are directed at the practice of using gradation of aggregates as a standard for the production of concrete and concrete materials. The importance of cement yield has been greatly exaggerated and gradation is therefore exaggerated in its importance.

There is no argument that cement should not be wasted, but neither should production and construction labor and equipment be wasted to save a little cement. There can be no difference of opinion there. The difference arises in the difference of viewpoint.

If there are any disagreeable provisions in the specifications they will remain to govern concrete practice so long as nothing is offered as a substitute or the undesirability is not explained. Those who have recommendations to make with respect to alterations or additions are welcome in every engineer's office so long as the suggestions are based on sound fundamentals. Patience and persistence tempered with tact when secured on a foundation of knowledge will secure for those why try almost all modifications. Traditions and precedent can always be compromised or rejected for something better. Progress consists of compromises.

The accompanying table gives strengths for field samples taken from a minimum void-sand proportion type of concrete, pictures of which are shown. Proportions 1:2.16:3.02:2.14. Washed samples show 30% through a No. 3.

Identification No.		Slump in inches	Compressive strength, 28 days, lb. per sq. in.
1.	5 bags per cu. yd.	2¼	3950
2.	5 bags per cu. yd.	1¾	3885
3.	5 bags per cu. yd.	2	4065
4.	5 bags per cu. yd.	2¼	3440
5.	5 bags per cu. yd.	2¼	3890
6.	5 bags per cu. yd.	2½	2785
7.	5 bags per cu. yd.	1¾	2970
8.	5 bags per cu. yd.	2	3890
9.	5 bags per cu. yd.	2¼	3370
10.	5 bags per cu. yd.	2¼	3755
11.	5 bags per cu. yd.	2½	2770
12.	5 bags per cu. yd.	1	4110
13.	5 bags per cu. yd.	2	3700
14.	5 bags per cu. yd.	2¼	4075
15.	5 bags per cu. yd.	1¾	3440
16.	5 bags per cu. yd.	2	3875
17.	5 bags per cu. yd.	2¼	3775
18.	5 bags per cu. yd.	1	3890
19.	5 bags per cu. yd.	2	2875
20.	5 bags per cu. yd.	2¼	3310
21.	5 bags per cu. yd.	1¾	3035
22.	5 bags per cu. yd.	2	3440
23.	5 bags per cu. yd.	2¼	2935
24.	6 bags per cu. yd.	2½	5920
25.	6 bags per cu. yd.	1½	4425
26.	6 bags per cu. yd.	1	5730
27.	6 bags per cu. yd.	2	5225
28.	6 bags per cu. yd.	2¼	5020
29.	6 bags per cu. yd.	2½	5500
30.	6 bags per cu. yd.	1½	5030
31.	6 bags per cu. yd.	1	6440
32.	6 bags per cu. yd.	2	5465
33.	6 bags per cu. yd.	2¼	5300
34.	6 bags per cu. yd.	2¼	5700
35.	6 bags per cu. yd.	2	5250
36.	6 bags per cu. yd.	1	5360
37.	6 bags per cu. yd.	2¼	4695
38.	6 bags per cu. yd.	2¼	5495
39.	6 bags per cu. yd.	2¼	5100
40.	6 bags per cu. yd.	2	4945
41.	6 bags per cu. yd.	1	5270
42.	6 bags per cu. yd.	2¼	5325
43.	6 bags per cu. yd.	2¼	6095

S. M. Hands and W. J. "Stonebreaker"

A study of these data will show that no definite relationship seems to exist between slump and strength even though the water in this concrete was measured at 50 lb. per bag and the proportions were weighed. Three sizes of aggregate were used in an effort to get uniform results. Naturally, one concludes that the slump "don't mean anything." The pictures explain how segregation has undone all the designing and accurate weighing and measuring. The contractor had three fully equipped inspectors on this job.

The field samples were fabricated according to A.S.T.M. standards by a laboratory expert who has been doing research work for eight years. This was done to insure against variations due to personal factors.

To show further how the minimum sand-minimum void concrete responds to control instruments and modern equipment a series of tests was run from field concrete under conditions similar to those shown in the accompanying pictures. Two samples were taken from the same batch, the first being the first concrete out of the bottom of the boom bucket and the second being the last out. A washed sample shows most of the large rock to be the last out of the bucket as would be expected from the pictures. The washed samples did not show a grading within the limits of the specifications; but a composite remixed aggregate composed of the washed samples would run through the center of the limits for each of the sizes required by the specifications. The first concrete out of the bucket is indicated as *A* and the last out as *B*. Five samples each were made according to A.S.T.M. standards and five each were made by filling the container and dropping it 30 times with the flow table. These are indicated as *H* and *F*. Only one slump was taken for each sample, but two were taken for each batch.

COMPARISON OF "A" AND "B" CONCRETE MADE BY DESCRIBED METHODS

Identification		Slump	Strength
1AF	6 bags per cu. yd.	2¼	5705
1BF	6 bags per cu. yd.	¾	5675
2AF	6 bags per cu. yd.	2	4990
2BF	6 bags per cu. yd.	1¼	5625
3AF	6 bags per cu. yd.	2¼	5540
3BF	6 bags per cu. yd.	1	6385
4AF	6 bags per cu. yd.	4	5430
4BF	6 bags per cu. yd.	1¼	4865
5AF	6 bags per cu. yd.	5	4820
5BF	6 bags per cu. yd.	1	4750
1AH	6 bags per cu. yd.	2¼	5545
1BH	6 bags per cu. yd.	¾	5050
2AH	6 bags per cu. yd.	2	6140
2BH	6 bags per cu. yd.	1¼	5865
3AH	6 bags per cu. yd.	2¼	6435
3BH	6 bags per cu. yd.	1	6065
4AH	6 bags per cu. yd.	4	4955
4BH	6 bags per cu. yd.	1¼	5185
5AH	6 bags per cu. yd.	5	5605
5BH	6 bags per cu. yd.	1	5165

Two methods of fabrication were used, and although every sample was perfectly sound and weighed the same per cubic foot, there is a difference in strength due to fabrication.

The table shows that field concrete does not produce concrete from which data can be secured to be interpreted according to laboratory standards. Four samples taken from the same batches give two different slumps and four different strengths. Batches 4 and 5

show slumps from 1 to 5 in. and the 5-in. slump shows a higher strength than the 1-in. slump. If there are any fundamental laws of concrete it must be assumed that in this case segregation and faulty fabrication have made this concrete not interpretable according to those laws.

The fact remains that the cores for this job show this to be true and that the effective depth design, regardless of sufficient unit strength, has not been realized.

It will be noticed that the *B* samples which contained most of the large aggregate show a lower slump than do the *A* samples. This is characteristic of mixes made up predominantly of large sizes. Considerable water is required to change this condition and it is this undesirable and inherent property of such mixes that make them undesirable and uncontrollable.

The average strength of this concrete can be maintained more uniformly and the full effective design depth can be realized by using more sand and no more cement. The aggregate under such specifications need only be uniformly and not exactly graded. All this theory is helpful, but let us not forget to be practical.

New Hampshire's New Methods for Highway Concrete

THE NEW HAMPSHIRE HIGHWAY DEPARTMENT has made a long step forward in the design and construction of concrete highways. It has recognized that the old-fashioned arbitrary methods of proportioning are not satisfactory to either the contractor or the engineering department. So it has developed the laboratory of the state to aid both. It furnishes the data for designing a mix from the available materials, and the contractors who have followed its advice have saved money by being able to use less cement and to make a more workable and uniform concrete.

The program of the laboratory, according to a recent article in the *Constructor*, is as follows:

1. Preliminary inspection of materials and sources of supply.
2. Testing of materials.
3. Design of mix by the calculation method.
4. Demonstrating and selling the water-cement ratio method to constructors.
5. Assisting in starting and controlling the job.
6. Rendering expert advice during inspection.
7. Evaulating the results obtained.
8. Gathering data on the experiences and opinions of interested parties.

An incident which shows how money may be saved is quoted. A contractor who had planned to use 1.70 bbl. of cement per cu. yd. following the arbitrary 1:2:3 specifications otherwise used, consulted the laboratory. He was shown that a designed mix with 1.40 bbl. per yd. would give the necessary strength. Although no guarantee went with this, he actually used 1.42 bbl. and the strength was 110 lb. more than the designed strength.

The following table taken from the article referred to shows the results obtained in 11 projects:

Projects	Year	Mileage	Compressive designed	Strength obtained	Cement designed	Factor obtained
Dublin	1927	1.77	2700	3135	1.45	1.51
Dover	1927	5.03	2700	2810	1.40	1.42
Claremont	1927	2.01	2700	3000	1.45	1.49
Concord	1928	2.68	2700	2975	1.32	1.40
Lebanon	1928	2.29	2700	2750	1.40	1.40
Manchester	1928	2.48	2700	3050	1.46	1.58
Salem	1928	1.58	2700	3670	1.45	1.55
Dublin	1928	3.15	2700	2640	1.36	1.44
Claremont	1928	1.90	2700	2673	1.50	1.46
Tamworth	1928	1.70	2700	3075	1.56	1.54
Lebanon	1927	0.85	2700	....	1.42	1.47

All these mixes are designed from the water-cement ratio needed for the given strength. W. H. Purrington, engineer of the department, adopted this method because, he says, of its proven results. He also points out that the method of testing fine aggregates (sand) employed by the department places the water-cement ratio on a different basis from that used elsewhere.

The method adopted for testing sand has thrown out comparison with Ottawa sand altogether and substituted the theoretical strength of a water-cement ratio as a standard. The first step is to add 359 cc. of water to 600 grams of cement to form a paste. These quantities are in the same ratio as 6¾ gal. of water to one bag of sand. Sand is added to this paste until the mixture shows a flow of 200 on the table designed and used by the Bureau of Public Roads.

Two-inch cube molds are filled with the mortar and after storage in damp air for 24 hours are divided into two groups, one to be stored in water six days, the other 27 days. At the end of these periods the cubes are broken. To be classified as a normal sand, 7-day cubes must break at 1800 lb. or over and 28-day cubes must break at 3000 lb. or over.

If the sand shows less than normal strength by these tests the department may permit its use with less water per bag. It sometimes happens that the contractor will prefer to do this, the loss in yield being less expensive than the cost of transporting a better sand a great distance.

In testing sand by this method the same cement has always to be used since the quality of the cement is the constant against which variations in the quality of the sand are tested.

The contractor is furnished with the figures calculated by the laboratory from the available materials on the water-cement ratio. Afterwards the proportions are checked by trial mixes. The laboratory aids the contractor as the work goes on by giving whatever information may be of benefit.

Transverse Test for Concrete Being Developed

THE TRANSVERSE STRENGTH of concrete has acquired considerable significance during the past several years in connection with the design of certain types of structures, principal among which are concrete pavements and bases. In view of the variations in transverse strength which would seem to be possible due to variations in methods of molding and testing specimens it becomes important that a standard procedure be adopted by the American Society for Testing Materials for transverse testing, and work is now under way in a sub-committee under the chairmanship of A. T. Goldbeck with this end in view.

Preliminary work has been done looking into the influence of certain variables in the molding of concrete specimens. This work was performed at the U. S. Bureau of Public Roads and was reported to the A.S.T.M. Committee C-9 on Concrete and Concrete Aggregates by L. W. Teller. The methods employed in his investigations may be stated briefly as follows:

Method 1. Rodding specimens with a ⅝-in. diameter round steel rod, using the standard method for molding compression specimens.

Method 2. Identical with Method 1 except that each layer of concrete was rodded 50 times.

Method 3. Spading with a spade 4½ in. wide and 6 in. long. The concrete was placed in two layers and each layer spaded 20 times.

Method 4. Identical with Method 3 except that each layer of concrete was spaded 50 times instead of 20 times.

Method 5. Tamping with a 2x2-in. square wooden tamper.

Method 6. Tamping with a 4x4-in. wooden tamper.

Other essential variations in the methods are described in the original paper by Mr. Teller. His conclusions are as follows:

1. That both the rodding and spading methods used are equally satisfactory so far as strength, uniformity and ease of fabrication are concerned.

2. That the additional manipulation of Methods 2 and 4 over that of Methods 1 and 3 results in little or no improvement in the specimens obtained.

3. That the tamping methods are not as satisfactory as rodding or spading methods.

General view of the Herzog Lime and Stone Co.'s operations near Forest, Ohio. The lime plant is at the left, coarse screening plant, center, and the new fine screening plant at the right

Crushing Plant With Measured and Controlled Screen and Crusher Feeds

Herzog Lime and Stone Company's Operation at Forest, Ohio, Has Two Distinct Screening Plants

THE EXPANSION of a plant without cutting in on the regular production is quite a problem; particularly is this so when the existing plant is limited in floor area, and has no room for placement of other equipment. Some rearrangement could be made of the machinery to permit the enlargement, but after all would be done, it is quite possible that a poorly balanced operation would result. Consequently, when the Herzog Lime and Stone Co. found its business was growing to such an extent that it just had to enlarge its facilities, it adopted the procedure of building an entirely new plant, supplemental to the older, and devoted solely to the production of material which its market called for.

With the decision to build a new unit, the task of modernizing the original plant was simplified. Steel girders were used to strengthen the retaining walls of the timber structure and the floors reinforced. Equipment was changed about to meet the new conditions with the result that the older unit is completely modernized and fits in quite well with the production scheme. Between this plant and the quarry, a small steel frame, galvanized-iron-sheathed structure to house the Symons crusher was erected.

A number of changes were made at the quarry also. Some time ago the original fleet of 19 Ford trucks of 1½-ton carrying capacity was supplanted by six White 5-ton motor trucks, three of which are model 52's and the others model 45, all equipped with solid rubber tires. These trucks have steel bodies made by the Van Dorn Iron Works, Cleveland, Ohio, which are raised and lowered by a mechanical hoist operated from the truck engine. Before being put in service, the bodies are reinforced in the Herzog company's shop. The floor is lined with 3-in. oak planking and covered with ½-in. steel plate; the inside walls of the truck are also lined with ½-in. plate. End gates of these trucks are removed and replaced by a scuttle tilted end which allows free passage of the rock dumping into the crusher.

With proper upkeep and repair, the trucks are expected to last at least 10 yrs. The bodies are repaired annually and will be renewed in accordance with modern developments. Because of the expense entailed in strengthening the bodies, the company is now building in its shop an all-steel body of its own design which will be tried out.

The quarry face has been developed over a number of years and has a length of about 3000 ft. A very good floor is maintained, all holes being filled with screenings to allow easier truck operation. The present height is about 65 ft., which, however, will soon be greater, for a new floor to the 90-ft. level is being made. Part of the quarry floor has already been lowered to this new level. Instead of deepening the present face, a new face, deeper in the bottom of the quarry is being developed to a depth of about 35 ft. This is for getting out the very hard dolomite at that depth. The crushing plant will operate intermittently between the two

Part of the quarry face, averaging about 65 ft. in height. A new floor to the 90-ft. level is being made at the right

Electric well drills putting down holes for the new quarry floor

Electric shovel loading rock to the motor trucks on the quarry floor

faces, separate storage to be maintained at each face.

Lowering of the quarry floor is necessary because of the nature of the deposit, which contains two different grades of limestone. The top 70 ft. of stone is a little soft for concrete aggregate, although entirely satisfactory for lime burning. Below this is a stratum, 35 ft. thick, of harder, denser dolomite, quite suitable for concrete aggregate, and it is this stone which the company desires to utilize in its crushing plant.

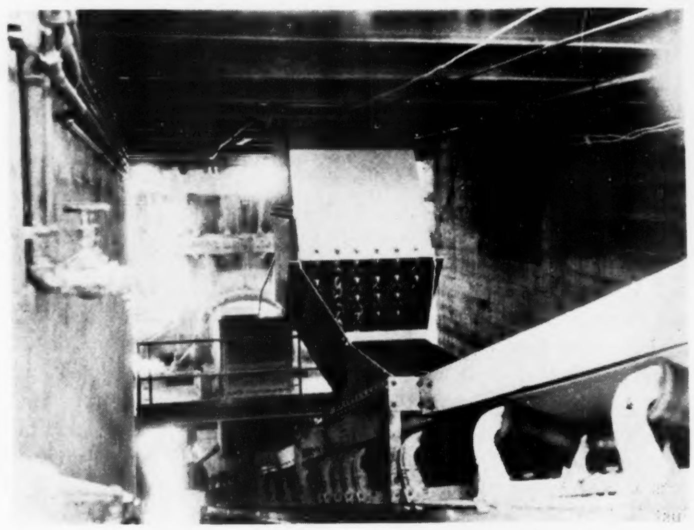
Overlying the rock is 6 to 7 ft. of overburden, which is removed by a Marion No. 40 steam shovel with 1¼-cu. yd. bucket to dump trucks. Primary drilling is accomplished with three Loomis "Clipper" electric well drills equipped with 5⅝-in. bits. All of these are working on the present quarry floor and putting holes down for the new floor. Each drill is making about 5 ft. per hour in the hard dolomite.

All holes are shot with Hercules 40% and 60% gelatin, Cordeau-Bickford fuse or Hercules No. 6 blasting caps. Secondary drilling is done with Ingersoll-Rand "Jackhamer" drills.

The loaded trucks run up a short inclined road from the quarry floor to dump their stone into the mouth of the primary crusher, a No. 10 Allis-Chalmers gyratory, driven by a 150-hp. Allis-Chalmers motor and Texrope. When the new quarry floor is made, a 42-in. Allis-Chalmers gyratory crusher will be placed and this will become the primary crusher and the present No. 10, the secondary.

The trucks carry about 6 tons of rock each, and are able to make the round trip between the shovel and the crusher in about five minutes. However, about 10 minutes is consumed on the present haul; this time including loading, dumping together with delays incident thereto.

Discharge of the No. 10 crusher, 4-in. and under, is chuted on to a 30-in. by 400-ft. c. to c. Stephens-Adamson belt conveyor equipped with Goodyear rubber belt and is carried to the coarse screening plant. This belt is driven by a 75-hp., 1600-r.p.m. General Electric Co. motor through a Link-Belt silent chain and Falk speed reducer at its head pulley. The conveyor discharges to the main scalper, an Allis-Chalmers, 72-in. by 24-ft. rotary screen by which six separations are made. For the first 2 ft. of its feed end the screen has 1½-in. openings; the next 2 ft. are 2 in., the succeeding 4 ft. sections 2-in., 2¾-in., 4-in., 4-in. (square), 5½-in., openings. The first five sections are perforated (round and square) steel plate



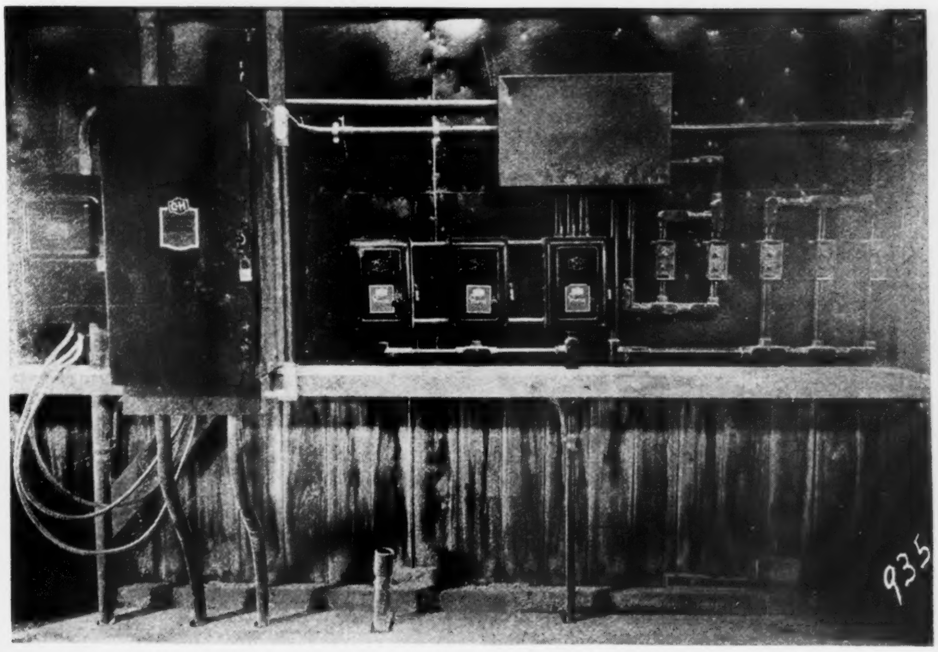
Loading end of the main conveyor at the discharge of the primary crusher. The by-pass hopper shows also

and the last section of Rolman manganese steel wire rods.

The largest sizes of stone passing over 5½-in. squares go to a respective bin for kiln stone. The next smaller size, 4-in. to 5½-in., goes to a respective bin for dolomite fluxstone, and next smaller sizes pass into their respective bins for commercial and road stone. Hoppers, chutes, gates, etc., beneath the screen are arranged that various sizes may be mixed in passage to bins, or that all sizes may be diverted into the respective bins for feeding the 4-ft. Symons cone reduction crusher, from 1½-in. down to 1-in. down; sizes diverted by this into the respective bin for feeding to the 30-in. belt conveyor which carries it to the secondary screening plant.

The smaller stone from the scalper, 1-in. down, is chuted to a double-decked Niagara vibrating screen, of which only the lower deck is used at present. This is covered with

Quarry trucks dumping at the mouth of the primary crusher



Control station at the coarse screening plant

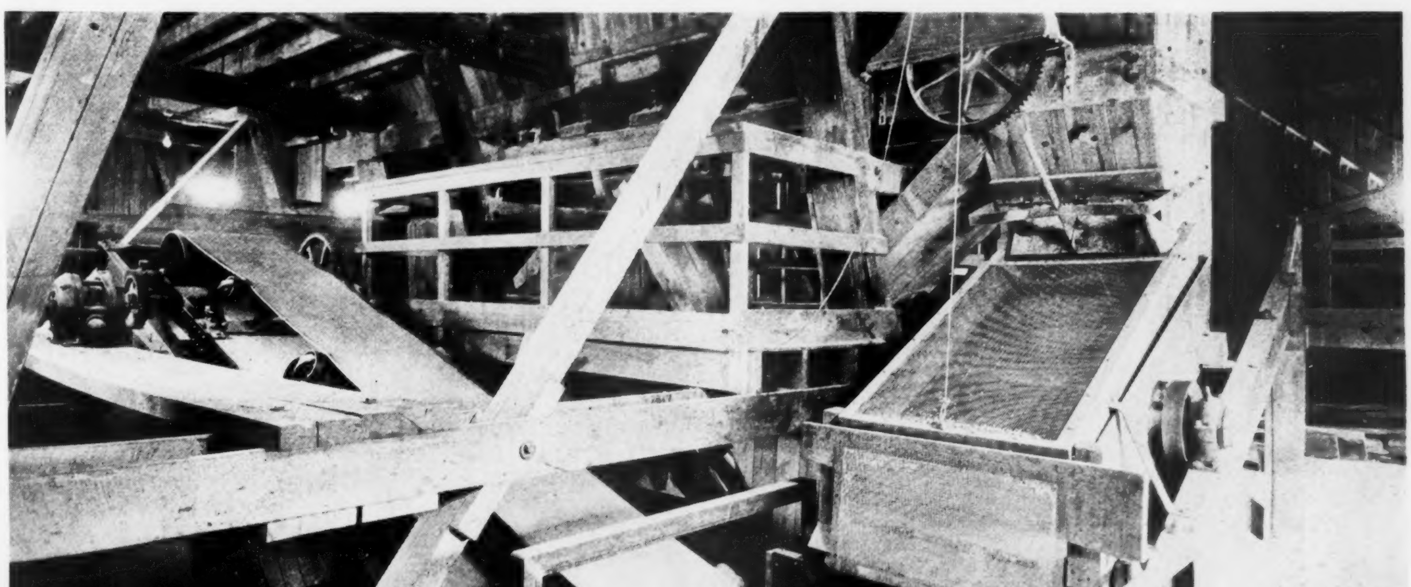
Finger and chute-type loading gates under the bins

a 1-in. wire screen cloth; the throughs pass to a feeding unit for the fine screening plant conveyor and the rejects go via a short conveyor to the bin over the secondary crusher. All material from this bin is fed to the Symons No. 4 cone, the secondary crusher, by means of a 6-ft. Stephens-Adamson variable speed belt feeder; this is operated as a unit by a 5-hp., 900-r.pm. Allis-Chalmers motor, Jones 60:1 worm gear reducer and J.F.S. variable speed transmission. The unit is remote-controlled and can be made to give greatly varied feeding rates. Discharge of the reduction crusher is returned to the main conveyor of the coarse screening plant by an 18-in. by 250-ft. centers Stephens-Adamson belt conveyor; this conveyor carries the material to the point indicated on the accompanying sketch, going part of the distance in a concrete tunnel underneath the loading tracks. This recrushed material passes through the same cycle of operations as the initially crushed stone.

The return conveyor is driven by a 50-hp. Westinghouse motor and open gearing, the Symons No. 4 by an Allis-Chalmers 100-hp. motor and Texrope and the Niagara vibrating screen by a 5-hp. Allis-Chalmers motor. All controls in the coarse screening plant are of Cutler-Hammer make; the safety switches were furnished by Westinghouse and General Electric Co.

At the primary crusher, arrangements have been made to by-pass the crusher; the stone can be dumped to a by-pass hopper when it is not desired or necessary to crush, and this feeds through a baffled chute feeder to the main conveyor and thence to the coarse screening plant.

There are eight wooden storage bins at the coarse crushing plant holding 150 tons each. The sizes stored are those mentioned previously as made at the primary screens. These bins are equipped with underneath loading gates, some of which are finger and others of chute type. Material outloaded is given a final rescreening in the loading chute to remove any unwanted fines. A double line of standard-gage railroad track runs under-

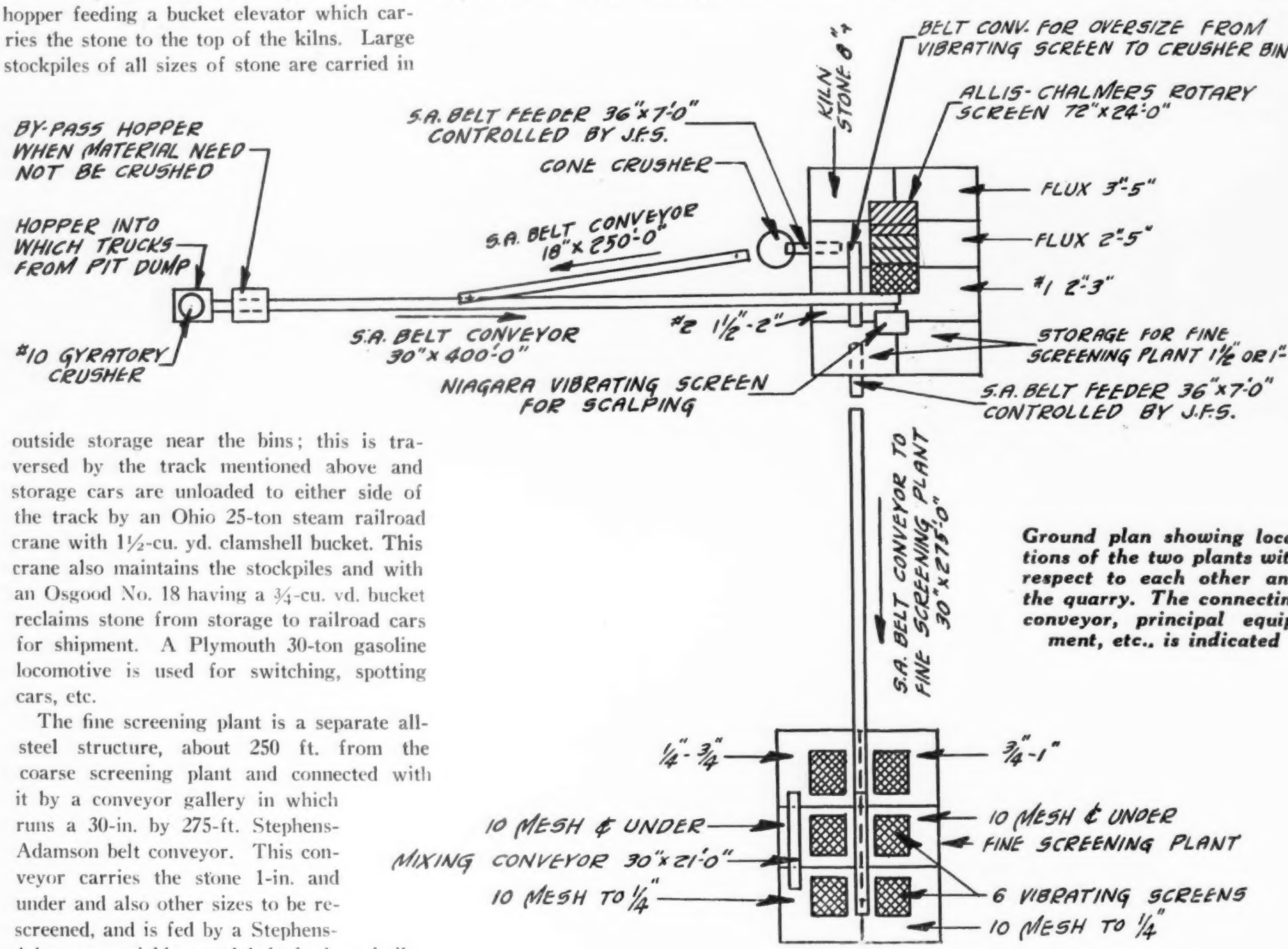


Collecting belt under the rotary sizing screen in the coarse screening plant. The vibrating scalping screen shows at the right, with the conveyor for oversize running underneath

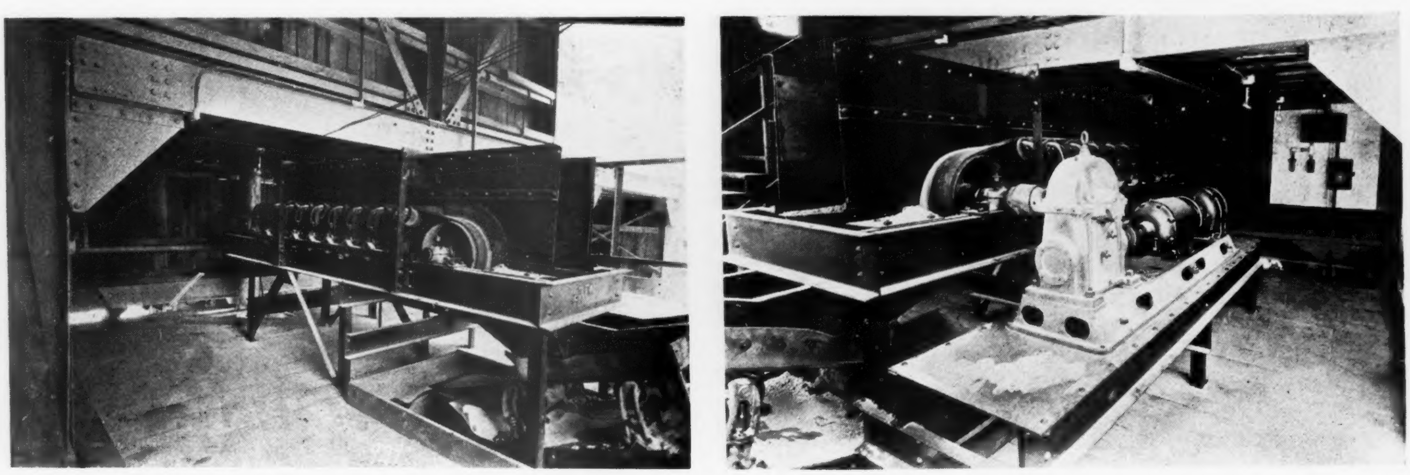
neath the bins; one of these tracks has a terminal at the lime plant and at outside storage. When kiln stone is desired, a self-cleaning hopper car is loaded and drawn to the lime plant, where it dumps to a track hopper feeding a bucket elevator which carries the stone to the top of the kilns. Large stockpiles of all sizes of stone are carried in outside storage near the bins; this is traversed by the track mentioned above and storage cars are unloaded to either side of the track by an Ohio 25-ton steam railroad crane with 1½-cu. yd. clamshell bucket. This crane also maintains the stockpiles and with an Osgood No. 18 having a ¾-cu. yd. bucket reclaims stone from storage to railroad cars for shipment. A Plymouth 30-ton gasoline locomotive is used for switching, spotting cars, etc.

The fine screening plant is a separate all-steel structure, about 250 ft. from the coarse screening plant and connected with it by a conveyor gallery in which runs a 30-in. by 275-ft. Stephens-Adamson belt conveyor. This conveyor carries the stone 1-in. and under and also other sizes to be rescreened, and is fed by a Stephens-Adamson variable speed belt feeder, similar in size and operation to that which feeds the secondary crusher, and located in the coarse screening plant. The speed of the feeder can be regulated from 7 to 42 f.p.m., giving a feed range of 50 to 300 tons per hour.

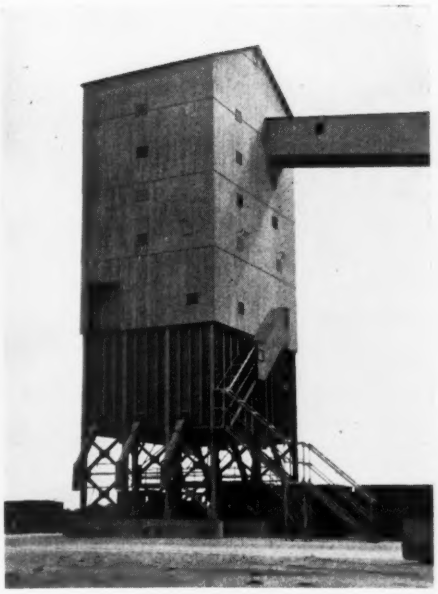
Discharge of this conveyor is to a chute feeding two Niagara 3x6-ft. vibrating screens located on the top floor of the plant. Feed to these screens is regulated by a gate in the chute by which any part or all of the feed can be directed to either screen, but the top deck has been removed, the material passing direct to the 10-mesh "Ton-cap" cloth on the lower deck; each is driven by an individual 5-hp. Allis-Chalmers motor and Texrope. Material passing the 19-mesh screen is chuted to bins below and the rejects to another battery of two Niagara screens on the floor directly below. These two screens have 10-mesh "Ton-cap" on the bottom deck and ¼-in. "Ton-cap" on the top deck. Throughs of the lower screen are chuted to the bins, that retained on this screen, ¼-in. to 10-mesh, passes to other bins, and the rejects of the top screen, ¼-in. and up, go to other chutes feeding the third and last battery of two vibrating screens, located on the floor below. This last battery is of a type similar to the others mentioned, but has ¾-in. wire cloth screen on the bottom deck and 1-in. on the top deck. The



Ground plan showing locations of the two plants with respect to each other and the quarry. The connecting conveyor, principal equipment, etc., is indicated



Variable speed belt feeder delivering undersize limestone to the conveyor running to the fine screening plant. The cut at the right shows the feeder drive:—a 5-hp. motor, geared speed reducer and variable speed transmission, operated as a unit



The fine screening plant

sizes produced here are ¼ in. to ¾ in., ¾ in. to 1 in. and 1 in. plus. All these pass to the storage bins below. Other sizes than the above are produced by merely substituting different sizes of wire cloth.

Mixed sizes of the screened material are produced in this fashion. Discharge of any of the screens is directed to a short mixing belt, 30 in. by 21 ft., c. to c., which rides in a steel carriage over the bins. This conveyor is reversible and can discharge its material from either end of the belt to bins below.

Drying While Screening

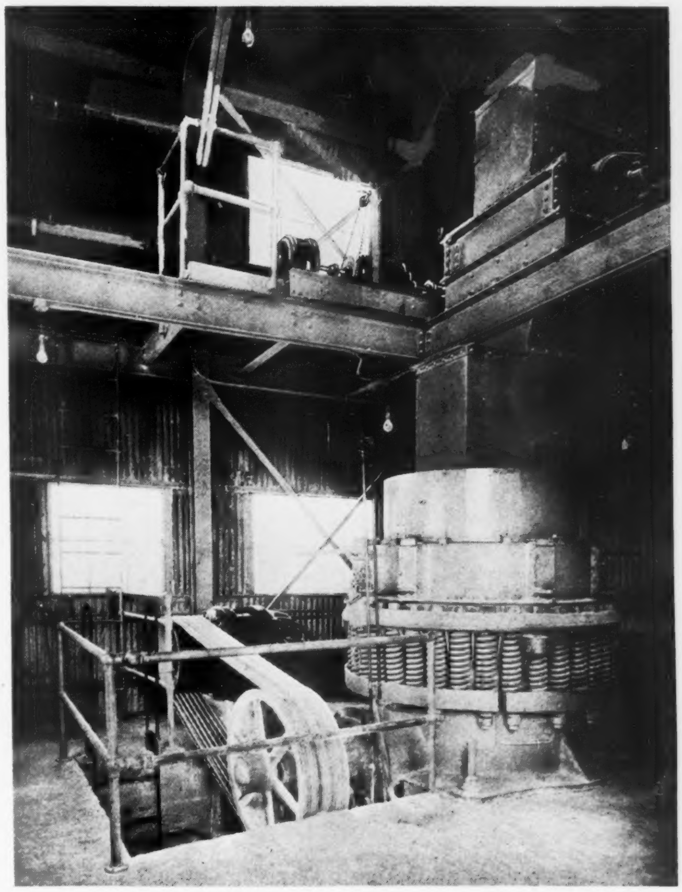
One of the unusual features of the screening lies in the use of an open gas flame to heat the stone as it passes over the screens. The purpose of this is to dry the fine stone (agstone), thus keeping the screen free and preventing caking in the bins. Each of the screens in the first two batteries is equipped with three open jet gas burners underneath the bottom deck running lengthwise with the screen. All stone passing through the screen must pass through the flame zone before going to the bins. The flame is long and yellow and probably not hot enough to draw the temper from the steel screen cloth. Natural gas is used.

There are six square bins, each of 150-ton capacity, equipped with loading spouts for truck loading and underneath quadrant-type gates for railroad car loading. The bins are of all-steel construction, double-walled, riveted throughout and amply reinforced with steel girders.

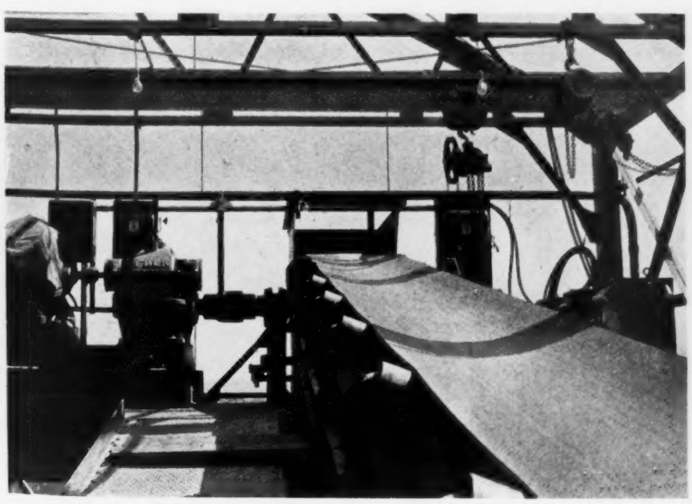
The coarse screening and fine screening plants operate as separate units, independent of each other. As mentioned previously, the single bin and variable speed feeders at the former plant take care of the stone requirements for the fine screening plant, but in case this latter plant is not operating, the pile builds up in the surge bin until it contacts a limit switch which automatically signals the primary crusher operator that the bin is full and to stop feeding. Operating units in each plant are electrically interlocked so that in case one piece of equipment is not functioning properly, etc., warning is given by siren and the equipment stops. All equipment except the crushers must be started in order from a "start" button, and the system does not allow the start of any piece of equipment until the preceding ones are working. The operating controls are placed conveniently near the equipment they are intended for.

The fine screening plant was designed conjunctively by the Herzog company and engineers of the Stephens-Adamson Manufacturing Co., who furnished much of the principal equipment, such as the "Sacon" conveyor carriers or idlers, steel chutes, etc.

Steel construction is one of the features of the plant; the floors and stair treads are of checkered steel plate; all parts of the steel work are riveted to cut down vibration



The secondary cone crusher and its drive. On the platform above is located the variable belt feeder, which delivers limestone to the crusher

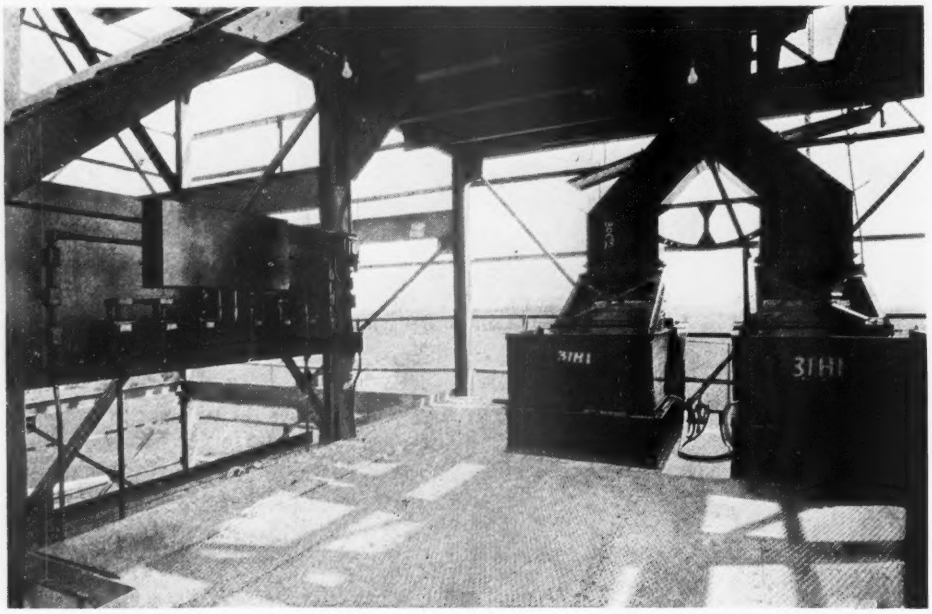


Head end of the conveyor carrying stone to the fine screening plant

Rear view of one of batteries of vibrating screens—Note the electric controller for screen

from the vibrating screens. Structural steel was supplied by the Bellefontaine Bridge Co., fabricated to the Stephens-Adamson Manufacturing Co. design.

Motors were supplied by the Allis-Chalmers Manufacturing Co., Milwaukee, Wis., and General Electric Co., the latter company furnishing also the electrical controls and



Vibrating screens on the top floor of the fine screening plant. The feed to the screens is controlled by the rod between the feed chutes. Gas lines for heating the screens are seen on the floor between the screen bases. All electrical controls for the plant are conveniently located on the panel at the left

switchboard. Work on the new plant was started in 1928 and operations begun early in 1929; the old plant was remodeled at the same time.

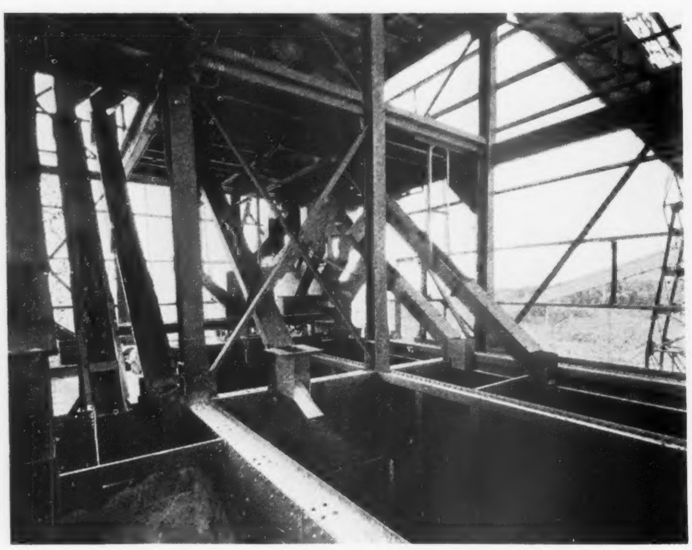
A large one-story building close to the crushing plant is utilized for a garage and warehouse. This company possesses probably one of the most complete stocks of spare parts and supply equipment of any in the crushed-stone industry. Every conceivable item, wherever used about the plant, can be found here. All sorts of bolts, carefully stored in racks; extra screen cloth, fuse and blasting caps, Roebling wire rope of different sizes on mounted spools, welding rods, lengths of chain, tires, small electrical hand tools were some of the things kept in supply. There was even a reserve rubber belt conveyor, 36 in. by 500 ft. in length! This stock is in charge of Wm. Wentz, superintendent, who estimated that fully $50,000 worth was on hand. Rather a goodly sum to be spent on spare equipment, but the company prides itself that it has never lost any time because the necessary parts and means to repair any piece of equipment were not on hand.

There is also a well-equipped repair shop in which many major repairs to equipment are carried out. In conjunction with this shop, the company maintains a special welding service truck by which repairs are made "in the field," so to speak. This is simply a rebuilt Ford truck with steel body, mounted on pneumatic tires, on which are placed a complete Oxweld-Acetylene welding outfit. When the call for welding comes, the truck is run to the place and the welder is all ready to work, for he has cylinders of oxygen, acetylene, welding rods, etc., right there with him. It so happened, at the time of the visit, that one of the links of the hoisting chain on the quarry shovel broke, and within an hour the break was weld-repaired and the shovel operating, the repair being made right on the quarry floor.

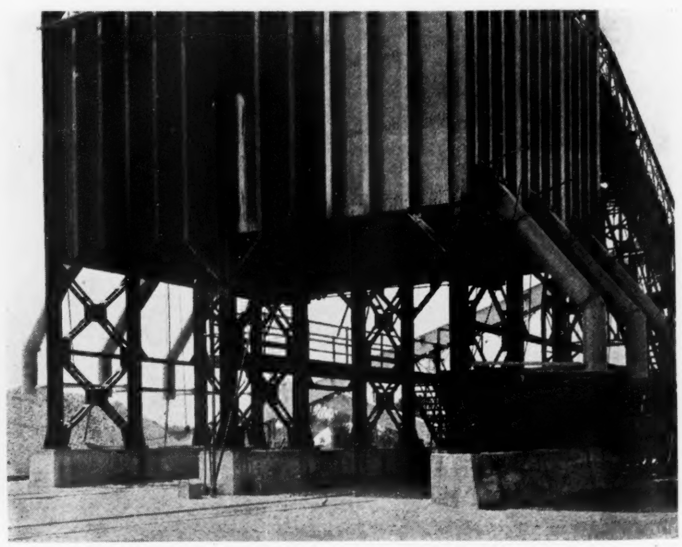
The quarry is kept dry by an Allis-Chalmers centrifugal pump, delivering 700 g.p.m. at 100 ft. head and driven by a 30-hp., 1740-r.p.m. Allis-Chalmers motor. This is housed in a small structure on the quarry floor in which is also a "Tripod" lift pump which supplies water to the hydrating plant. All valves and pipe lines are of Crane Co. make. The 6-in. lines of the centrifugal pump have welded joints made by the company welder.

Some of the electric power is purchased from the Ohio Power Co. and some generated by the company in its own power plant, where two 190-hp. Miller gas engines are operated to drive a General Electric Co., 480-v., 200-amp., dynamo. The power generated passes through a Westinghouse switchboard. Purchased power comes in at 2300-v. and is stepped down to 440-v. by General Electric Co. transformers located near the mill buildings. This current is used principally for the equipment in the fine screening plant and the shovels and passes through a General Electric switchboard. Various meters on this board indicate the load at particular points, power factor, etc.

Air for the secondary drills is supplied by two Ingersoll-Rand compressors, one of which is a 9x8, type ER-1, driven by a 30-hp. Westinghouse motor, and the other, a



The steel storage bins and the feeding chutes from the screens on the floors above



Exterior of the bins showing the arrangements for rail and truck loading

Transfer house where material from the reduction crusher is returned to the main conveyor

Part of the outside storage. The locomotive crane keeps up the stockpiles and loads cars

smaller unit, is operated by a 15-hp. Century Electric Co. motor. A third and smaller Fairbanks-Morse Co. compressor supplies the air for the air-gas mixture sent to the Miller gas engines. All the air receivers are equipped with safety release valves.

It requires about 41 men to operate both crushing plants, and the division of labor follows:

Quarry trucks (6 at 1 man each)	6
No. 70 shovel	4
No. 40 shovel	4
Blast hole drilling	3
Secondary drilling	2
Primary crusher	2
Coarse screening plant	1
Fine screening plant	2
Loading bins	2
Stockpiling crane	2
Switching locomotive	2
Auxiliary truck	1
Blacksmith and garage	3
Stock room	1
General repair, greasing	4
Supervision	2
	41

The last five labor items in the above, covering upkeep and maintenance, supervision, etc., also serve for the lime plant in the ratio of about ⅔ time for the crushing operation and ⅓ for lime manufacture.

The Herzog company maintains an office at the plant, three miles south of Forest, Ohio. Officers of the company are Bert Herzog, president and treasurer; J. D. Miller, vice-president; Fred Cramer, secretary. William Wentz is superintendent.

Sand for Water Filters

AN ABSTRACT of a paper on water purification, published in *Water Works and Sewerage* for October, has some valuable ideas for sand producers who want to get into the filter sand business. The Cincinnati filters were to be re-sanded and 3,800 tons were needed. Filter sand from distant points cost \$6.20 and \$6.90 delivered. The engineers in charge chose to buy Ohio River sand locally for \$1.60 per ton, delivered, and dry and screen it themselves.

The sand purchased had an effective size of 0.24 to 0.27 mm. and an effective size of 0.34 to 0.38 mm. was wanted with a coefficient of 1.30 to 1.50. Tests showed that screening out the fines left 73% of sand that met the requirements.

To do this work it was decided to install a kerosene burning rotary dryer and two electric vibrating screens. These are to be housed in a three-story building and hoppers and portable conveyors are to be installed for handling the products.

As the filters have run 21 years without re-sanding it is presumed that all this equipment is to be charged to the 3,800 tons of filter sand to be produced. This with the cost of operating and of disposing of the waste would bring the total to a figure where it would seem that local producers could compete successfully.

In more than one instance it has happened that water-works engineers have produced their own filter sand, and it is something of a reflection on the sand and gravel industry that they should be able to do so economically.

Production of Potash in 1928

POTASH PRODUCED in the United States in 1928 amounted to 104,129 short tons of potassium salts containing 59,910 short tons of potash (K_2O), according to the United States Bureau of Mines, Department of Commerce. Sales by producers amounted to 105,208 tons of potassium salts containing 60,370 tons of K_2O. The potash materials of domestic origin, sold by producers in 1928, were valued at \$3,029,422 f. o. b. plants. About 6,260 tons of potassium salts with an available content of 2,100 tons of K_2O, remained in producers' stocks December 31, 1928. The output increased 35.5% in gross weight with an increase of 38% of K_2O content. The sales of salts increased 11% with an increase of 22% in K_2O content. The total value of the sales increased 24%. Stocks remaining in the hands of producers at the end of 1928 were 14% less than at the end of 1927. The production was chiefly from natural brines in California and distillery residue from molasses in Maryland. A small amount of alunite was shipped from Marysvale, Utah, for experimental work.

The potassium salts imported for consumption into the United States in 1928, according to the Bureau of Foreign and Domestic Commerce, amounted to 975,661 short tons. This represents an increase of 33.5% in gross weight over the imports for 1927. The estimated K_2O equivalent of these imports is 330,000 short tons. The total value of the imports was \$22,519,992, which was 22.5% more than for 1927. The potassium salts imported chiefly for fertilizer amounted to 931,616 short tons (K_2O content approximately 310,000 tons), valued at \$18,227,830. This was an increase of 35.5% in total quantity, and 38% in value.

The potassium salts imported for the chemical industry amounted to 44,045 tons (K_2O content approximately 20,000 tons), valued at \$4,292,162, an increase of 2% in total quantity, and a decrease of 17% in value.

Pittsburgh Quadrangle Survey

THE TOPOGRAPHIC and Geologic Atlas of Pennsylvania presents the results of the state's geological survey in the Pittsburgh quadrangle. This bulletin is one of a series describing the areas of the state by quadrangles, and supplements all folios previously published. The coal deposits as well as other mineral resources, including limestone, clay, sandstones, sand and gravel, are described and illustrated graphically.

Geologist's Report on Sand and Gravel Prospects in Specific Local Area*

Professor Freeman Ward, Lafayette College, Easton, Pennsylvania, Studies and Reports on Reading Locality

THE PROBLEM INVOLVED finding deposits (a) of proper quality; (b) where there was opportunity for washing, because the trade, and especially the large contract, is demanding a uniform, washed product; (c) large enough to warrant putting money into a washing plant and other equipment; (d) near railroad or other trunk line of transportation. Trucking will pay (if roads are good) when the distance is not over 10 miles, is doubtful between 10 and 15 miles and unprofitable with greater distance. Of course if the roads are good and one could get $4 or more a ton for delivery, it would pay to haul by truck 25 or 30 miles. This is a rare case.

Uses of Sand and Gravel

The author lists the following uses or markets for sand and gravel:

CONSTRUCTION

1. Concrete—for highways, streets, sidewalks, buildings, blocks, fence posts, etc.
2. Mortar—for laying brick, stone, etc.
3. Plaster and finishing coats.
4. Asphalt paving.
5. Roofing.
6. Cushion sand—for laying paving brick, etc.
7. Road dressing—gravel alone, with binder for sand-clay roads, for oiled roads.
8. Railroad ballast.

ABRASIVES

9. Sand paper.
10. Sand blast.
11. Grinding glass.
12. Sawing stone.
13. Scouring soaps.
14. Tumbling sand.

MANUFACTURE
(the main constituent)

15. Glass.
16. Sand-lime brick.
17. Silica brick.

MANUFACTURE
(as an accessory)

18. Foundry sand.
19. Brick making.
20. Pottery glaze.
21. Filler for paint.
22. Filler for fertilizer.
23. Sweeping compound.
24. Dusting tar paper.
25. Carborundum.
26. Alloys.

MISCELLANEOUS

27. Filters.
28. Engine sand.
29. Fire sand.
30. Standard sand.
31. Playground sand.
32. For golf courses.
33. On paint.
34. Bedding stock cars.
35. Sand flotation.
36. Horticultural purposes.
37. Agricultural testing.
38. Bird sand.

Specifications

Quite logically, one kind of sand will not do for all purposes. A sand that is too fine for concrete may be just the thing for asphalt pavement; a sand that would never do for glass making may be entirely suitable for foundry purposes. The specifications or qualities required for each of the uses listed have been rather exactly determined, though authorities differ as to details. The extensive literature on the subject should be consulted by those who expect to be producers of these commodities. No attempt will be made here to discuss these specifications, but a partial list of the necessary qualities may make clearer the scope of the requirements.

> **Editor's Explanation**
>
> ***WE ABSTRACT certain parts of Prof. Ward's report NOT with the idea of inducing new producers to locate in the Reading, Penn., district, because we assume our good friends are already supplying this market, but to show HOW a market area may be studied—and should be studied—prior to any development or expansion by a producer.***

In general, sand and gravel should be clean; that is, free from loam and organic matter. The individual particles should be durable. Texture plays an important part; this refers to the sizes of the individual particles and the proportions of the various sizes present. Their features are determined by standardized methods of screening. The shape of the particles is to be considered—too many flat pieces is objectionable. Chemical composition is important only for a few of the uses, especially the high silica sands. Strength tests are made for comparison with standard sands. Other properties that may enter into the qualities of good material are color, fusibility, permeability, sharpness of particles.

Those who wish to improve or standardize their product would do well to study the precise requirements that the best trade demands. Many articles are published by the National Sand and Gravel Association, Munsey building, Washington, D. C., by the American Society for Testing Materials, Philadelphia, Penn., and by similar organizations. Specially those who are interested in the specifications for highway work should consult Form 408, Pennsylvania Department of Highways, Harrisburg; or if planning to produce molding sands consult "Molding Sands of Pennsylvania" issued as Bulletin M-11 by the State Geological Survey, Harrisburg. Similarly each of the uses listed has its own literature.

Definitions

This report makes use of certain terms whose meaning will be better understood by referring to the following definitions:

Bank sand or gravel—This term applies to the ordinary sand and gravel such as is seen along a river bank. It has been carried there, sorted and deposited by water. It is loosely packed and hence easy to shovel or dig into. Coarse and fine material are arranged in alternating layers. Individual pieces commonly show the wear and tear they have suffered during transportation; that is, they have lost their angularity; some may even be well rounded. Often called river sands.

Quarry sand—This is made artificially by crushing rock. The bedrock is quarried in the usual manner by the help of more or less blasting. The blocks of rock are further reduced by crushers or rolls and then sorted into sizes by screens. The ordinary crushed rock is equivalent to the various gravel sizes; the finer sizes are the sand.

Texture—This term refers to the sizes of individual particles and also the proportion of the various sizes present.

Sand—grains less than ¼ in.; may be coarse, medium, fine.
Fine gravel—¼ to ¾ in.
Gravel—¾ to 1½ in.
Coarse gravel—1½ to 6 in.
Boulders—greater than 12 in.

Except in the case of sand, the natural deposits seldom contain one size only, as above defined. Rather, there is a mixture of several sizes. For field purposes the writer somewhat arbitrarily used four classes.

Very coarse—Probably 50% greater than 3 in. Much coarse gravel. Considerable number of cobbles. Boulders always present. Sand content low.
Coarse—Probably 35% greater than 3 in. Much coarse gravel. Cobbles fairly common. Boulders seldom present. Sand moderate.
Ordinary—Less than 20% but more than 5% over 3 in. Moderate coarse gravel. Cobbles seldom present. Sand and fine gravel the dominant sizes.
Fine—Less than 5% over 3 in. Abundant sand.

This classification may be used in describ-

*Abstracted from Bulletin 99 (November 20, 1929), Commonwealth of Pennsylvania, Department of Internal Affairs; James F. Woodward, secretary; Topographic and Geologic Survey, George H. Ashley, state geologist, entitled "Sand and Gravel in the Reading Region, Pennsylvania," by Prof. Freeman Ward, Department of Geology, Lafayette College, Easton, Penn.

ing a single large bed, or, more often, for the average of the whole deposit.

Quantity—Since quantity is one of the requirements of the sand and gravel problem, the descriptive terms used must be given some exactness. They are based on the requirements for commercial plants. It will seldom be possible to get proper returns on capital invested in a washing plant and other equipment unless the operation is continued for at least 10 years. On this basis the following terminology is used:

	Output per day	Reserves required
Very large	1000 tons	2,000,000 tons
Large	500 tons	1,000,000 tons
Medium	200 tons	400,000 tons
Small	100 tons	200,000 tons

Experience shows that it is hardly practicable to set up a washing plant unless the output averages 100 tons per day.

Value—Waste material or unsalable product of a quarry or pit needs as much consideration as the quantity in the deposit. In a region where hard rock quarries and crushed rock are common there will be little use for a bank deposit in which gravel and coarse gravel dominate. Whatever its quality, coarse gravel will be hard to sell and constitutes an element of waste. The opposite is true; in a region where hard rock quarries are scarce and the bank deposit is largely sand, a great deal of the sand will have to be sold at a low price in order to get rid of it at all. In such a region a bank deposit with gravel and coarse gravel as well as sand would be the most profitable. In the Reading region, for instance, a straight sand deposit would be much more valuable than a coarse gravel-sand deposit. Again, much of the deposit may be fine sand, too fine for concrete. If the customers are only concrete makers, the excess fine sand is a waste product, in the way and unprofitable.

It amounts to this, the value of a bank deposit even when both quantity and quality are excellent, depends on the market demand within the range of profitable transportation.

Producers who are willing to study the many varieties of sand, know the many possible uses and specifications of each, may turn their waste product into a salable article and so increase the value of their deposit as a whole. For instance, (*a*) an excess of coarse gravel may, when crushed and washed, be more acceptable in specification work than ordinary crushed rock; (*b*) the overburden may be just right for foundry sand; (*c*) excessive fine sand, while not salable for concrete work, may be used in finishing work, asphalt paving, striking sand, etc.; (*d*) the fine powder washed from high silica quarry sand might have a use in scouring compounds, etc.

Present Sources

All of Reading's local sand is quarry sand. Usually a quartzite or other highly siliceous rock such as quartz schist and less commonly granite is crushed for this purpose. In three of the quarries the rock is a coarse-textured trap, and in another quarry is a conglomerate. All of the rock is loosened by weathering to a depth of 10 to 25 ft. The quarries are located at various points, some near and some rather distant from the city.

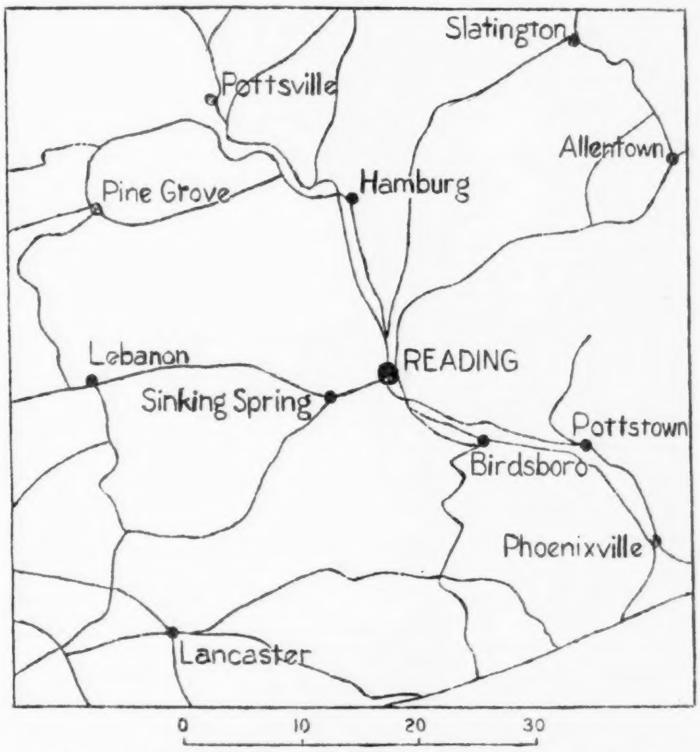


Fig. 1. Map of Reading, Penn., and vicinity, showing the railroad lines along which the principal explorations were made

All are in the hills or uplands, never in the lowland areas. The following is a list of quarry sand producers near Reading and the neighboring towns:

Quarry or company. Location	Miles from Reading
Temple Silica Sand Co., about ½ mile northeast of Temple	6
Angstadt Quarry, about ½ mile northeast of Stony Creek	4½
Highland Sand Co., Neversink Mountain	1
Seidel Sand Co., about ½ mile southeast of Salem Church	6
Springs Sand and Stone Co., about 1 mile south of Sinking Spring	7
John H. Gring Quarry, about 1½ miles south of Sinking Spring	7
Peter Beyer Quarry, about ½ mile southeast of Fleetwood	12
John T. Dyer Quarry Co. (a), about 1 mile south of Guckerville	9
John T. Dyer Quarry Co. (b), at Trap Rock	14
John T. Dyer Quarry Co. (c), about 2 miles southwest of Monocacy	14

Many other quarries have been opened but are now abandoned. New quarries could be opened at many other places.

The sand is prepared by crushing and screening the rock. Only at the Dyer quarry is the product washed. The screening produces sand of three sizes—concrete, mason, finishing. The gravel sizes (sometimes referred to as "spalls") are of the sort suitable for coarse aggregate, railroad ballast, etc. Chemically, most of the sands are of the high silica type, selected portions being suitable for glass sand. Much of the run-of-quarry product will show 95% silica, except of course that made from trap rock.

The daily output varies with the size of the plant and the demand. The plant capacities range from 25 to 300 tons per day. The sand sells for $2 to $3 per ton delivered in Reading and $1 to $1.60 per ton at the quarry. In carload lots it may be bought at one quarry for $0.50 per ton.

Four of the quarries are located along the railroad or on spurs connecting with the railroad. The others deliver by truck. The many good roads factilitate hauling by truck, especially for the shorter distances.

Crushed and screened furnace slag is used in making concrete blocks or as coarse aggregate, little being consumed in any other way.

Jersey Sand Used Considerably

Distant sources—A great deal of "Jersey" sand is used in the city. This is a bank sand, washed, and of standard quality, coming from several points in the Trenton district, including Morrisville and Tullytown, Penn. This means a railroad journey of 75 to 90 miles. With transportation such a big item in the ultimate cost of sand, this is an important part of Reading's sand bill. Jersey sand at the point of production costs about 70 c. per ton, while the freight is over $1 per ton. Jersey sand is delivered in Reading at an average cost of $3.20 per ton, while quarry sands average $2 per ton.

Quarry vs. bank sand—In spite of the fact that Jersey sand costs over $1 a ton more than the quarry sand, a great deal of it is used. Estimates place the total Jersey sand used as one-third to two-fifths of all the sand used by the city. The question naturally arises why do people pay more to import sand when they have sand at home? Considering all the uses of sand in the region, $40,000 to $50,000 per year could be saved if only the local sand were used.

Of one thing we can be sure, there is no shortage of rock from which the local quarry sand is made. There are enormous reserves

of this material, enough to furnish several times the total needed for many years.

In the first place one must realize that no one sand can serve all purposes. The list of 38 uses on a previous page should convince one that several varieties and types of sand are required.

Prejudices Against Quarry Sand

But if we confine our attention to the commoner uses, such as construction, there are some other reasons for the choice between the two types. Jersey sand by long usage in the east has become a standard product accepted as having the proper quality. The quarry sand, on the other hand, does not yet have a completely accepted position in the sand market. The burden of proof, thus, is with the quarry sand. The writer in talking with many dealers, contractors, masons and some engineers finds staunch supporters of each type of sand. No doubt there is some prejudice in the matter, and no doubt part of it is a matter of opinion, like buying any other article of trade.

Not many analyses are available. Tests on sand from five of the quarries show a strength equal to or greater than the standard Ottawa sand, in one case nearly twice the standard. It is true, too, that the quarry sand has been used successfully in many large structures in the region, as bridges, roads, factories, etc.

Despite this, two facts remain against the quarry sand as a whole. One is that the quarry sand is not uniform; the other is that there is apt to be too much "fines" in this sand. The rock is not all alike through the hills; its character may differ in one quarry. Sometimes too little care is taken in removing the overburden.

The problem of the quarry sand industry, then, is greater care in the selection of the rock and in handling the overburden, installation of additional screens to get rid of the fines, in some cases installation of washing systems, running of many tests and analyses to get exact information on what is being produced, and finally a good selling and advertising plan to place the improved, uniform product on a par with Jersey sand.

No doubt there will always be a demand for Jersey sand for certain uses.

Detailed Studies

Until the quarry sand is standardized, as suggested in the preceding paragraphs, the demand for a good bank sand equal to the standard Jersey sand will remain large; and afterwards there will always continue to be some need for the bank sand. There is the further possibility that the quarry sand producers will be satisfied with conditions as they are.

Hence the greater part of the field work in this region was devoted to the search for bank sand. A large deposit of good bank sand within 25 miles of the city would save the long haul and high freight costs of the New Jersey product. Because of the importance of transportation in the sand problem, the search for bank sand was confined to areas along and near the railroad lines. The need for a sand of proper quality and in quantity sufficient to justify exploitation was always kept in mind.

Barren areas—There is always an advantage in knowing one's limitations. Uncertainty is disturbing. To prove the lack or absence of a certain material is one of the factors in any industry. To state the worst first, then, certain areas in the region, we are sure, contain no commercial bank sand and gravel.

Bank sand being a water-laid material, it is natural to look for it in present or former water courses. The limestone lowland that extends from Allentown through Reading to Lebanon is a logical place to look for it. No prominent streams run the length of this area, but geologists believe that streams of the past had a prominent part in making the lowland; so remnants of old stream deposits might be there. All of this lowland near Reading, and that part of it within a mile of the railroad lines farther from the city, was examined with care.

No Bank Sands in Lowland Area

No deposits of bank sand were found in this lowland. Furthermore, it is evident that there are none. The proof for this rests on several grounds. In the first place, bedrock is near the surface everywhere. It is astonishing what a luxuriant growth of crops, forest and grass can exist with solid bedrock only a foot or a few feet below. Numerous quarry holes and railroad cuts consistently show bedrock close to the surface. Any exposed section of the sub-surface shows the smooth surface with its soil and vegetation closely underlain by limestone. The top of the limestone is irregular, and the depth of soil and sub-soil commonly is 1 to 6 or 8 ft., with occasional spots 10 to 15 ft., depending on the quality of the particular bed of limestone at each spot. See accompanying sketch, Fig. 2. Here and there a quarry or railroad cut shows the cover above the bedrock not more than 3 ft. thick. Cellar holes and other shallow excavations encounter limestone. Still more convincing is the fact that so much limestone outcrops along the roads. Most road cuts and gutters are very shallow, and yet bedrock shows. The obvious conclusion is that if bedrock is so near the surface there is not room enough for a loose deposit of bank sand to be present on top of it. In the second place, the material that rests on the bedrock is a clayey substance with occasional hard angular fragments of chert, siliceous limestone, etc., scattered through it, and with no stratification or layers. The desired bank sand with its stratification and water-worn fragments is a wholly different thing. A third line of evidence proving the absence of bank sand is the type of topography or land form. The forms of water laid deposits, such as bank sand, are quite different from those produced by erosion (wearing away) or solution. Depositional forms are lacking, while erosional and solutional forms dominate in the area.

Other places where one might expect deposits of bank sand are along the base and lower slopes of the uplands or hilly areas.

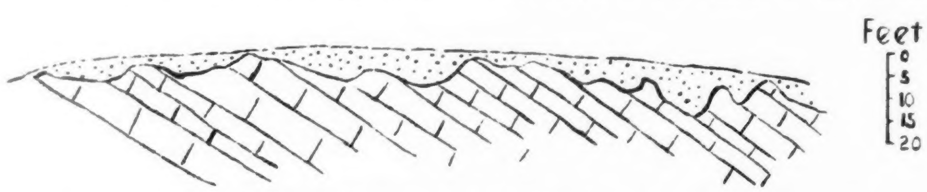


Fig. 2. Profile section of quarry face showing the soil resting on uneven surface of limestone

It is conceivable that swift streams running off of the uplands might deposit sand and gravel where they slow down on entering the lowland. The field evidence does not bear this out. While it is true that there are patches of material formed this way yet they are scarce and insignificant. The streams are too small and short to have accomplished anything of importance. Several railroad cuts expose the material in these bordering slopes at some length. It is uniformly an unsorted mixture of abundant angular rock fragments in a sandy clay matrix. It is hillside wash, creep and fan material slowly worked off from the uplands. It thins out rapidly towards the lowland.

Other areas barren of commercial bank sand are along and near the railroad from Birdsboro to Suplee, and from Sinking Springs to Ephrata.

Favorable areas—There are only two streams of any consequence or size in this region—the Schuylkill river and its tributary, Maiden creek. Railroads along these streams make transportation available for any sands found.

Schuylkill valley—The flat floor is convincing evidence of water-laid deposits. This is a typical valley "fill." It means that the valley was once deeper but has since been filled up to the level of the present valley flats. The filling has been brought in by the river and its tributaries. Along its whole length small streams and rain wash have gullied the hillsides, sweeping in debris eroded from the slopes. The main stream has moved this farther along and, using the fragments as tools, has in turn deepened and widened its valley. The load has accumulated during the years and constitutes the

fill. During this process of transportation and deposition the currents have worked over the material, grinding and sorting it. This produced a layering or stratification, an alternation of silt, sand and gravel, as the currents varied in strength.

Not All Fills Found Suitable

It is clear, then, that wherever there is such a fill there is a chance of commercial sand and gravel. The character, quality and quantity of the fill must be determined before development is begun, because a fill may not be salable material.

Unfortunately there is little positive evidence about the character of the fill or its depth. The valley was examined from Pottsville to Royersford. Along this entire stretch only five holes or pits, and only seven wells were found from which records could be gotten. There are many more wells but all of them were put down 25 to 100 years ago, and the present owners know little or nothing about the materials encountered. The records, though scanty, show definitely that sand and gravel are present in this fill. The top material is fine, ranging from a silty fine sand to a sandy loam. Some of it would do for molding sand. It commonly has coarse gravel or cobbles scattered sparingly through it. In two places a few small boulders were seen. All of these stray pieces are partly worn. This top material is probably 2 to 8 ft. thick. Below it are layers of sand and gravel of usable quality. In certain places one would expect to strike layers of a finer texture, such as silt or clay. The deepest section seen was a pit 12 ft. deep. This had 3 ft. of sandy loam (with a few cobbles here and there) on top and 9 ft. of gravel with sand lenses. The sand was used locally. Well records show the presence of sand, in abundance at two places or wells.

Another thing must be considered in evaluating the quality of the deposit. Shale is the principal rock in Schulykill valley north of Leesport. It is not particularly strong or tough. Sand containing many grains of shale would be of poor quality. The shale south of Reading has a sandy quality. However, in the one deep pit where the material could be seen and handled shale fragments were extremely scarce. This pit is in the fill south of Reading.

The coal contamination in the channel need not be considered a serious menace. It is only a superficial deposit along the present stream and has accumulated only since the start of anthracite mining about 1850. Before the culm was run into the Schuylkill, sand used to be taken from the river bed and used locally for mortar and plaster.

Evidence as to the depth of this fill is meager. One well is reported 28 ft., another 60 ft., a third 70 to 80 ft. deep without striking bedrock. A fourth well is given as 188 ft. deep, but there is some doubt about the record. The other three wells are shallow. One can easily believe that the depth is considerable even if not known exactly.

All parts of the Schuylkill valley are not equally favorable for the recovery of sand and gravel. From a point south of Reading (near Neversink) up to Leesport the valley fill is very narrow, so would not yield large quantities. From Leesport to Hamburg the fill is wide and so more favorable as to quantity. From Hamburg to Pottsville and also up the Little Schuylkill river the flats are narrow. In the other direction, from Neversink to a little below Pottstown the flats are widest; below Pottstown they are narrow again.

Favorable Places

On the basis, then, of the size of the deposit only two portions of the river flats are favorable—one from Leesport to Hamburg, the other from Neversink to just below Pottstown. Of these two, the second is much the better chance, partly because of the greater size and partly because freer from possible shale contamination. Any shale pieces supplied in the upper area would have been worn down and carried away by the time the lower area was reached. Specifically, the area from about a mile above Gibraltar and the other between Birdsboro and Monocacy. Several other tracts have medium to large reserves.

It should be borne in mind that no test holes have as yet been put down. Since deep wells are so scarce and their records so poor the properties should be proved both as to quality and depth by digging a number of test holes. Ground water will be encountered within 10 to 15 ft. As water is bound to be abundant and rather near the surface, commercial development will probably depend on suction dredges.

In many valleys there are terraces of sand and gravel on the sides above the flat bottom. Such terraces are remnants of a once deeper fill which has in larger part been removed by subsequent erosion. There are no high terraces of this sort along the Schuylkill valley. The high terraces at a few places are either wholly rock terraces or with a veneer of material too thin and clayey to be of any commercial use.

Maiden Creek valley—This valley is a miniature of the Schuylkill valley. There are typical valley fills along it, so that here also is a possibility of finding sand and gravel. No pits or well records are available to give evidence as to the character or depth of the fill. The valley was examined up to Trexler. The only place where the width makes the deposits worth considering is from about a mile below Virginville up to Dreibelbis. Elsewhere the valley has only a narrow fill that would not be worth considering for a good development. This one tract has as bordering rock a considerable quantity of shale so that some contamination from this source is to be expected. On the whole the possibilities here are not equal in quality to those in the Schuylkill valley already discussed. On the basis of quantity alone there would be several reserves of medium size, or if the whole tract were worked continuously along the valley a large development can be counted on.

Some sand has been taken from the creek bed for local small jobs. There are no high terraces along the valley. In this respect it is like the Schuylkill valley.

It should be emphasized again that no test holes have been put down. They would, of course, be necessary to prove the extent and character of the sand and gravel.

Minor Sources

Minor sources—There are several sources of sand which provide small amounts for local use but which will never be adequate for large scale production.

Along many small streams, particularly in the uplands and hilly districts outside of the limestone areas, there are bars or other smaller spots where sand has accumulated. These streams are shallow and there is no great difficulty in digging out enough sand for small jobs of plastering, concrete, etc., around the farm. Such sand is usually clean and suitable for the purpose intended. Sometimes it can be used direct, sometimes it needs to be screneed.

A similar source, though of lesser importance, is the same that is washed out of roads or gullies by occasional rains rather than by permanent streams.

A rather unusual type of sand occurs several miles east of Kutztown and north of Topton and Mertztown. In this vicinity there are a number of old mine openings where iron ore was dug 30 or more years ago. The ore is described as "gravel" ore because the fragments of brown hematite were small and had mixed with it a great deal of fine chert and quartz. In preparing this ore it was screened and washed. The waste from this process constitutes the sand. Several hundred thousand tons of it were piled in the neighborhood of the workings. Most of this has long since been hauled away and used in place of ordinary sand.

Summary

The local sands now in use are all quarry sands not as yet standardized fully enough to satisfy all the trade demands.

Bank sand to supplement the quarry sands is shipped in from New Jersey in large quantities.

The field work was confined largely to a search for bank sand.

The only possibilities for bank sand in the region are along the Schuylkill and Maiden creek valleys.

The most favorable location is along the Schuylkill between Neversink and Pottstown, the second best between Leesport and Hamburg. The third choice is along Maiden creek from below Virginville to Dreibelbis.

The size and character of these deposits is yet to be determined by test holes.

Hints and Helps for Superintendents

Old Shaft Kiln Serves as a Lime Storage Silo

AT THE Sonora, Calif., plant of the United States Lime Products Corp., one of the old shaft kilns has been converted into a storage silo by simply removing the fire brick lining and leaving the draw hopper and gates in their original place. The ground quicklime can be drawn into sacks or barrels through a second small chute, fastened to the side of the draw gate as shown in the illustration.

Unloading gate of lime storage silo made from old kiln

Device Permits Throwing Spring Switch from Locomotive Cab

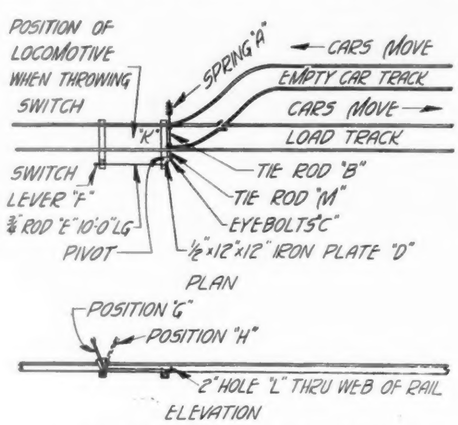
By J. PALMER CAMM
Watonga, Okla.

THE accompanying illustration shows a spring switch design which will enable a man on a quarry locomotive to do all his switch throwing from the cab of the locomotive. The special feature of this is that after throwing the switch from the cab so that it is closed in favor of the load track, the empties being pulled from the empty track will move the switch points of their own accord, thus leaving the switch set for the load track.

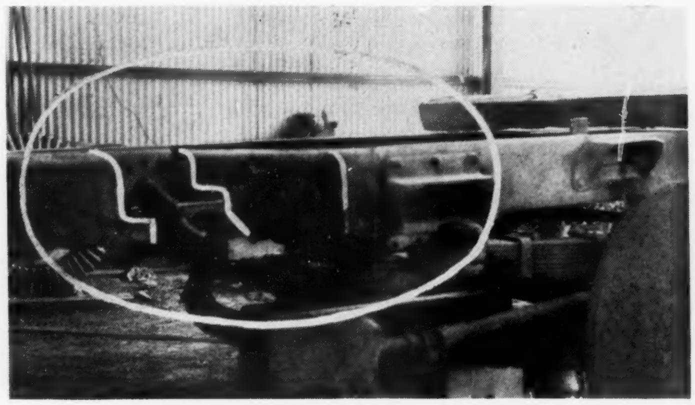
Previous to installing this switch it was necessary for our locomotive man to pull the entire string of empties past the switch, and then walk back to the switch in order to throw it in favor of the loads.

The complete operation of this switch is as follows: Consider the switch as shown in the plan closed in favor of loads. The locomotive pushes a string of cars in past the switch on to the load track, uncouples and backs past switch to position *K*, from which position switch lever *F* is thrown to position *H*. This opens the switch in favor of the empty track. The locomotive now goes into empty track and couples on to empty cars. It then pulls empty cars until locomotive is back to position *K*, from which position (without stopping) the engineer throws switch lever *F* from position *H* to position *G*, thus closing switch in favor of load track. Empty cars now proceed to open switch, tie rod *M* sliding through hole *L* in web of rail and also through eye bolt *C*. The switch is then returned in favor of loads by spring *A*.

This is a very convenient arrangement for a switch which is used for cars passing over it in any direction.



Design of swing switch which is operated from locomotive cab



Breaks in a truck frame repaired by welding

Weld Repairing of Quarry Truck Frames and Bodies

THE CUSHING Stone Co., operating a quarry and crushing plant at Amsterdam, N. Y., uses motor trucks to carry rock from the quarry to the crusher. Frames for these trucks are all reinforced before putting on the all-steel, end-dump body and the work is done in the company's shops by a welder and machinist. The steel bodies are also welded.

Occasionally the frames break and then the truck is brought to the company shops for repair. The illustration shows a multiple fracture on one of the truck frames. There were several breaks which, in this instance, ran clear through the width of the frame. (The breaks have been accented to give some idea of their extent.) These were repaired by welding a piece of channel iron to the side of the frame and the truck restored to service. In a number of cases, where the frame has been welded, any breaks which later occurred were in other places than at the weld.

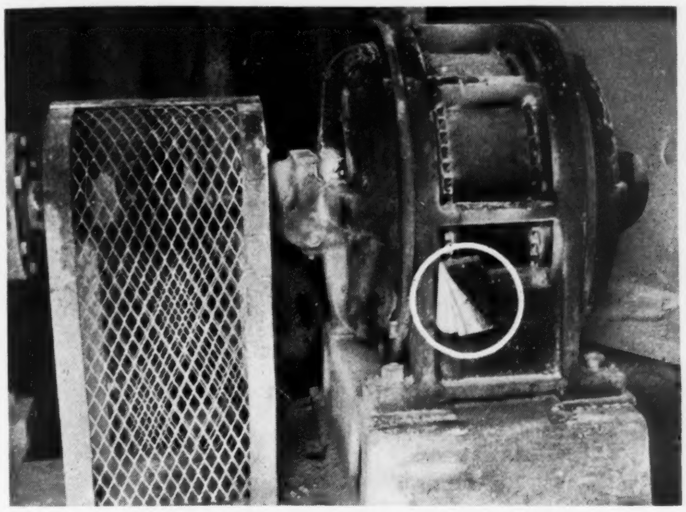
Welder working on one of the truck bodies

For welding the truck bodies and other welding the company has a General Electric

200-amp., portable arc welding machine. For repair work on bodies, frames, metal cutting, an oxy-acetylene outfit mounted on a two-wheel truck is in service. One of the illustrations shows the welder using this outfit to make repairs on truck body.

System in Lubrication

HERE'S ONE for superintendents who believe in systems, and in safety-first for the equipment in their care. Mark the little notebook hanging on a string attached to the motor? Every motor at the plant of the Chazy Marble Lime Co., Chazy, N. Y., has one. In it is a record of every time the motor is oiled. No guess work. Every superintendent probably keeps track of the mileage of his motor car and renews the oil every 500 or 1000 miles. Why shouldn't the same care be given expensive plant equipment? D. K. Evans is the manager of the plant and Clyde Cook is superintendent.



Time records of the motor lubrication are kept systematically

Air Receiver Explosions

CONSIDERABLE has been published to date as to why air receivers explode, but unfortunately they are written after the explosion. The illustration given here might be captioned at some future date, "Why the so and so air receiver exploded." It shows a vertical air receiver installed at a certain plant. A drain or blow-off is securely closed and apparently to make doubly sure that the receiver would never be drained a 1½-in. iron plug had been screwed into the valve.

This photograph is only one of many that our staff have secured relative to this particular subject and carelessness in installing air compressors, especially in older plants, is quite common. In this case the receiver set in an out-of-the-way place and in the center of a small swamp, thereby making it difficult for the operator to properly drain the receiver even were this possible.

Painting in Damp Weather

SLOW drying and wrinkling of paint are two troublesome characteristics often encountered in paint jobs carried out during cold and damp seasons, according to the *Dutch Boy Quarterly,* published by the National Lead Co. Clear dry weather will insure a good job, but in case the painting must be done in damp weather, care should be taken to use a pure linseed oil reasonably free from "foots"; one of the principal causes of slow drying is the use of an inferior grade of linseed oil. Danger from wrinkling can be minimized by seeing that the finishing coat is well brushed out. Linseed oil will thicken in cold weather and it is this thickening which is the indirect cause of wrinkling. The immediate cause, however, is that the paint is applied too thick. Turpentine in the finishing coat will often thin the paint sufficiently so that it can be brushed out in a thin film. Although the use of turpentine removes some of the gloss from the finishing coat, the addition of small quantities not exceeding one quart to the standard finishing coat formula will not seriously affect it.

The same authority contains many other useful and helpful painting hints.

Why air receivers explode—look at the plugged drain valve!

Quarry Steps Made from Scrap Pile Material

THE "HINTS and Helps" columns are just a gathering place for good ideas and are intended to give operating men the benefit of the observation made by ROCK PRODUCTS editors on their visits to the many plants in this country.

Parts of scrapped equipment went into the making of these quarry steps

Now the author of this "hint" has been lowered into quarries in skips, crawled up and down shaky ladders to reach some others and slid into a few with very slight damage to the quarry, so when he noted the steps leading into the quarry of the Midwest Crushed Stone Co. at Greencastle, Ind., made from old pipe, old rotary screen plates for treads and a few odd and ends of angle iron all neatly welded he was immediately struck with the fact that it was a mighty good idea. What do you think?

Cable Protection

AT THE Security plant of the North American Cement Corp., near Hagerstown, Md., the limestone is hoisted up a short incline to the crushing plant. The track at the foot of the incline is curved for convenience in reaching the quarry, hence the cable used to hoist the cars singly does not follow the curvature of the track but naturally assumes a straight line between car and hoist. Under ordinary conditions the cable would thrash around over the rock surface and in time would do considerable damage to itself. To prevent this the company has provided a series of old pipe laid at right angles to the direction of pull of the cable and in such a manner that the wire rope does not come in contact with the ground.

Two Patents for Quick-Setting Lime Product

A PATENT was granted October 22, 1929, to Chauncey C. Loomis and Alexander D. Macdonald, covering a proposed method of making a quick-setting lime product. The patent was applied for in 1926. Mr. Loomis is now the assistant to the president of the New England Lime Co., Pittsfield, Mass. The patent specifications (No. 1,732,409) verbatim, follow:

This invention relates to lime products adapted for the preparation of plastic putty or paste for various uses such as plaster, mortar, cement and the like. Among the principal objects of the invention is the provision of a lime-containing product of this type which is exceptionally quick-setting and which does not possess the disadvantages of the so-called quick-setting lime products hitherto known.

"We are aware that prior to the present invention attempts have been made to prepare quick-setting lime products by mixing gypsum frequently in combination with so-called retarders, with ordinary quick lime or with hydrated lime and also more recently by partially carbonating hydrated lime with carbon dioxide gas, but these products possess certain disadvantages which render their use unsatisfactory in actual practice, such as low sand-carrying capacity, unsatisfactory workability under trowel, lack of strength after setting, a tendency to corrode metal laths, excessive shrinkage after coating or other similar objectionable characteristics possessed, either singly or in combination by the several products.

Desirable Properties Claimed

"The improved lime product of the present invention is substantially free from these objectionable properties. Furthermore, it possesses certain advantages over retarded gypsum plasters, pure quick lime or pure hydrated lime plasters when these are used alone, since it combines to a considerable degree many of the desirable properties of each of these products without exhibiting any of their more pronounced undesirable characteristics. Thus the improved product in some of its forms has quick-setting qualities approaching or equalling those of retarded gypsum putties or plasters and yet at the same time it possesses a workability under the trowel substantially equal to that of high grade quick lime plaster. The new product also possesses a sand-carrying capacity similar to that of quick lime plaster and yet at the same time is subject to less shrinkage after coating than the latter. In comparison with hydrated lime plasters the improved product has many advantages, particularly with respect to quick setting properties, shrinkage, strength and workability.

"Various other advantages and objects of our invention will appear more fully from the following example which is given as an illustration or embodiment of our invention, it being understood that we do not restrict ourselves to the specific details set forth in the example but that these may be varied without departing from the true scope of our invention as set forth in the appended claims.

The Process

Example: One hundred and twelve lb. of quick lime containing approximately 95% calcium oxide is ground to a degree of fineness such that substantially all of it will pass a 50-mesh sieve. This ground or comminuted quick lime is next placed in a rotary kiln through which hot lime kiln gas containing ordinarily from 15 to 30% by volume of carbon dioxide is passed, care being taken that the gas comes into intimate contact with and passes over the surface of the particles or lumps of the comminuted lime. The kiln gas preferably should be sufficiently hot to maintain the lime particles at a temperature between about 600 and 700 deg. C. during the process. The contact between the gas and the particles is maintained until the individual particles have absorbed on an average about 20 to 25% by weight of carbon dioxide as indicated by the increase in weight of the mass. The heat liberated by the reaction between the quick lime and the carbon dioxide assists in maintaining the temperature at the elevated temperature specified in this particular example. If necessary heat is applied externally to the rotary kiln to keep the temperature at this range. The process may be carried out continuously by tipping the kiln slightly at an angle so that the lime flows through the kiln at such a rate that it is carbonated to the desired degree during its passage through the kiln.

Structure and Composition of Particles

"Micro-chemical examination of the product thus obtained under a low power microscope shows, after crushing the particles, that they are composed principally of an inner core of quick lime and an outer portion or shell of lime carbonate. In carrying out this micro-chemical examination the crushed particles are treated with dilute acid solution which liberates carbon dioxide gas from the portions of the particles containing calcium carbonate, the results showing that the carbonate is located mainly in the outer portions of the particles in the form of a shell surrounding an interior portion or core of quick lime. Other suitable micro-chemical tests show the same structure and composition.

Slow Slaking Product

"The product is further characterized by a slow rate of slaking as compared with that of ordinary quick lime or dolomitic quick lime in proportion to the calcium oxide present and this is accompanied by a corresponding slow rate of liberation of heat when slaked with water such that during the first thirty minutes after adding the water a total amount of heat is evolved which is substantially less than that produced in the same period from the slaking of dolomitic quick lime in proportion to the amount of calcium oxide present in the two cases.

"This characteristic property of our improved lime product referred to in the preceding paragraph we have designated the 'initial thirty minute slaking heat.' This property is susceptible to quantitative measurement and enables one to determine in many instances whether a given product is substantially identical with the product of the present invention. In carrying out such a quantitative measurement of the property in question, a determination is first made of the calcium oxide content of the sample to be tested. A weighed quantity of the product is then admixed with water in the proportion of one part by weight of water to each part by weight of calcium oxide present in the sample and the total amount of heat evolved during the thirty-minute period after the addition of the water is measured in any suitable manner as by means of a suitable calorimeter. This heat may frequently be measured with sufficient accuracy for the purposes of this test by admixing the water and lime in a beaker and determining the heat evolved by noting the rise of temperature of the water, taking into account the mass of water present. In either case an entirely similar measurement is made upon dolomitic quick lime of definite composition as a standard for comparison and the conditions arranged so that the heat lost by radiation is substantially the same in the two cases. The total heat evolved in the thirty-minute period is divided by the number of pounds of calcium oxide present in the sample or standard and the result taken as the 'initial thirty-minute slaking heat. Dolomitic quick lime containing between 35 and 45% by weight magnesium oxide is used as the standard of comparison.

"The initial 30-minute slaking heat of our improved product determined as described in the preceding paragraphs will vary according to the degree of carbonation of the comminuted quick lime and also with the density, porosity and other properties of the quick lime employed in our process, but it will ordinarily amount to less than one-tenth of that of the standard dolomitic limestone specified, i. e., dolomitic quick lime containing between 35 and 45% by weight of magnesium oxide.

"In making the above described measurement of the initial 30-minute slaking heat the sample tested and the standard dolomitic quick lime taken as a standard of comparison should both be crushed or comminuted to substantially the same degree of fineness or state of subdivision or comminution and the conditions of measurement otherwise made substantially identical in the two cases.

"We have discovered that this initial 30-minute slaking heat per pound of calcium oxide is a rough measure of the quick-setting properties of the product in the sense that the product having a relatively low initial 30-minute slaking heat per pound of calcium oxide will set in a relatively shorter period of time.

"As previously indicated, the specific details as set forth in the example may be varied considerably without departing from the true scope of our invention, depending upon the character of the quick lime to be treated in each particular case and also upon the use to which the finished product is to be put and upon various other considerations.

Other Reagents Such as SO_2 or S May Be Used

"Thus the amount of carbon dioxide absorbed by the quick lime may be varied between about 3% and about 40% by weight according to the results desired and the temperature may vary between about 500 deg. C. and 850 deg. C., although the middle range specified in the example is preferred. So also gases of widely varying carbon dioxide content may be utilized for carbonating the lime. The degree of comminution of the quicklime may also be varied, although no substantial proportion of the quick lime particles should be larger than about one-fifth of an inch in diameter since we have found that these cause 'popping' of the dried plaster.

"We have also discovered that sulphur dioxide may be used as the fluid re-agent instead of carbon dioxide and also that fluid sulphur either in the vapor or liquid state may be employed for this same purpose. It will be evident, however, that when the latter re-agent is employed, the conditions of treatment must be altered to adapt them to the known properties of gaseous or liquid sulphur. The products obtained with sulphur dioxide gas or with fluid sulphur or similar re-agents are not so satisfactory, however, as those obtained with carbon dioxide gas and we therefore prefer to employ the latter re-agent.

Mixed Products

"We have found that the partially carbonated quick lime products described above may be mixed with ordinary quick lime or hydrate of lime or both, with advantageous results for many purposes. In preparing such mixtures we prefer to employ about 40 parts by weight of the partially carbonated granular product of the above example to 60 parts by weight of quick lime or hydrated lime, but an improved quick-setting lime is obtained even when as little as 10% by weight of the partially carbonated quick lime product is present in the mixture.

"We have found also that portland cement, gypsum or hair or any combination of these may be advantageously admixed with any of the above described products prior to shipment and that these mixtures may be stored under proper conditions for reasonable periods of time without objectionable deterioration.

"In using our improved lime products after preparing the putty in the usual manner it should be troweled or worked into place for setting and permitted to dry before the water in the putty has sufficient time in which to penetrate the outer insoluble shells of the particles of carbonated quick lime, thereby converting the latter into hydrated lime, since if this is allowed to happen many of the most desirable properties of the product are adversely affected or entirely destroyed.

"It will be observed that the increase in weight of the quick lime due to the combination of the carbon dioxide therewith between the limits above specified (i. e., 3% to 40% of the original weight of the quick lime treated) corresponds approximately to a range of from about 0.07 to about 1.85 parts by weight of calcium carbonate or lime carbonate to each part by weight of anhydrous calcium oxide or quick lime.

"We claim:

Claims

"1. The method of processing quick lime which comprises partially carbonating the quicklime by bringing it into intimate contact with carbon dioxide, the quick lime being in a state of comminution such that substantially all of it will pass through a sieve of five meshes to the inch, the carbonation being continued until the increase in weight due to carbonation is not less than about 3% and not more than about 40% of the original weight of the quick lime before carbonation.

"2. The method of processing quick lime which comprises partially carbonating the quicklime by bringing it into intimate contact with carbon dioxide, the quick lime being in a state of subdivision such that substantially all of it will pass through a sieve having five meshes to the inch, the carbonation being continued until the increase in weight of the lime due to the carbonation amounts to between 20% and 25% of the original weight of the quick lime.

"3. The method of processing quick lime which comprises partially converting the quick lime into insoluble lime compounds by bringing it into intimate contact with a gas containing carbon dioxide, the quick lime being in a state of subdivision such that substantially all of it will pass through a sieve having five meshes per inch, and the said conversion of the quick lime into the insoluble lime compounds being discontinued before more than about half of the quick lime has been converted into the insoluble lime compound.

"4. The method of processing quick lime which comprises partially converting the quicklime into insoluble lime carbonate by bringing the quick lime into intimate contact with carbon dioxide, the quick lime being in a state of subdivision such that substantially all of it will pass through a sieve having five meshes per inch, and the said conversion of the quick lime into insoluble lime carbonate being discontinued before more than one-half of the quick lime has been thus converted into insoluble lime carbonate.

"5. A quick-setting lime composition comprising comminuted lime the particles of which are composed of quick lime and lime carbonate in the proportion of between about 0.466 and about 1.156 parts by weight of lime carbonate to each part by weight of quick lime, the degree of comminution or subdivision of the comminuted lime being such that substantially all of it will pass a screen having five meshes per inch.

"6. A quick-setting lime composition comprising comminuted lime the particles of whic hare composed of quick lime and lime carbonate in the proportion of between about 0.466 and about 1.156 parts by weight of lime carbonate to each part by weight of quicklime, the degree of comminution or subdivision of the comminuted lime being such that substantially all of it will pass a screen having five meshes per inch, and hydrated lime in the proportion of between 1/9 and 4/9 parts by weight of the partially hydrated comminuted lime to each part by weight of hydrated lime."

Harrison Patent

Patent No. 1,718,955 was issued July 2, 1929, to Douglas M. Harrison of East St. Louis, Mo., and assigned to the McKenzie Motor Co., Pittsburgh, Penn. This patent was applied for in 1925, at the height of the interest in quick-hardening lime mortar. The patent specifications read as follows:

"This invention relates to a composition for accelerating the set of lime products.

"The chief object of the invention is to produce a hardener which has the property of setting up and hardening the lime products, although it does not quickly dry the same, such as plaster, stucco, mortar and the like, and in about a week's time, whereas

the same hardness heretofore has been obtained only after two or three months' time has elapsed if other and present commercial lime hardeners are employed.

Activating Agents

"The chief feature of the invention consists in the addition of powdered relatively inert material such as coal ash, shale or shale ash, calcium chloride or the like, or its equivalent, and in mixing therewith an activating agent such as marcasite (FeS_2).

"Furthermore, a waterproofing constituent may be added.

"The resultant hardener is added to the lime product; that is, plaster, mortar, stucco and the like in the usual manner.

"It is well known that lime products, such as plaster, mortar, stucco and the like, require a considerable drying time and a considerable time for hardening. This hardening is the result of the formation of calcium carbonate from the lime in the form of calcium oxide or calcium hydroxide, lime usually being slaked when mixed with the usual ingredients to form the aforesaid lime products. Charcoal burners are frequently utilized to dry and to harden interior lime construction.

"Lime hardeners are commercially old, but the best hardeners at present commercially employed accelerate such hardening of the lime products so that the same can be said to be substantially dry in a period from two to three months, and to have acquired an initial hardening within a relatively short time, such as a week or 10 days, which initial hardening is at least sufficient to permit the lime product to be further worked upon such as for finishing, painting and the like.

Hardening Stage Accelerated

"The present invention is directed to a hardening agent for the aforesaid lime products, which secures substantially the same degree of hardening heretofore obtained in from two to three months, within a week or approximately 10 days' time, and to secure a hardening within a day or less equivalent to the hardening heretofore obtained with other lime hardeners in a week or 10 days' time. The matter of drying the lime product is not as important as obtaining the quick-hardening, for the latter permits working by the same plasterer without changing from job to job. In the following it is to be understood that any statement of proportions or amounts is to be considered as illustrative and not restrictive in character in any way whatsoever, unless specifically mentioned as a definite proportion in a claim or claims, for experimentation has determined that the proportions may be varied within relatively wide limits and give satisfactory service without serious or deleterious results in the finished lime products. Such proportions as are given, however, are based upon the utilization of 100 lb. of lime or similar equivalent material, which is included in a mix which may be varied to suit or satisfy the particular requirement.

Use of Shale, Coal Ashes, etc.

"One of the chief ingredients of the hardening composition is a relatively inert material such as coal ash or a shale material, and this may be an oil shale either in pulverized form or in ash and pulverized form. Such a material derived from several sources is relatively cheap and when production of oil from oil shale is more commercially employed, the resultant shale ash will be available as a waste product. One shale which has been satisfactorily employed, is that known as the New Albany, found at New Albany, Ind., and the following is an approximate analysis of a typical sample of ash therefrom, dried at 110 deg. C.:

	Per cent.
SiO_2	65.03
CaO	1.26
Fe_2O_3	14.84
Al_2O_3	13.96
MgO	1.32
P_2O_5	.08
SO_3	.22
TiO_2	1.02
Na_2O	.91
K_2O	.72
Li_2O	.58
Loss on ignition	1.81
	99.75

"Other oil shales, however, have been satisfactorily employed and may be substituted for the foregoing shale.

"Another important ingredient in the hardening composition is a suitable iron-sulphur compound. Such suitable compounds are iron pyrites (Fe_2S_3) or marcasite (FeS_2), commonly called 'brass ball' in coal mining practice. This material is reduced in size and is mixed with the shale and the chief ingredient. The foregoing material is hereinafter termed the activating agent and may be composed of either or both of the before mentioned or other suitable iron sulphur compounds.

"The chief ingredient is calcium chloride or any of its well known equivalents; that is, equivalents which include a water-absorbing and hardening property, without seriously effecting or producing objectionable characteristics in the resulting lime product.

"As an example, and only by way of example, the following suggestive formulae which have been experimented with and found satisfactory, are herewith included.

Preferred Procedure

"For every 100 lb. of lime or less equivalents in a lime product mix, there may be included a hardener composed of approximately 1 lb. of shale or shale ash and approximately 4 lb. of calcium chloride, or its equivalent. A second formula which has been very satisfactory is one which includes 3 to 4 lb. of calcium chloride and 2 to 1 lb. of marcasite. A third sample included approximately 1 lb. of shale or shale ash, approximately 1 lb. of marcasite and approximately 3 lb. of calcium chloride.

"It has been determined that the third example mentioned produced the quickest hardening, and that shale ash was more satisfactory than shale. This may or may not be due to the fact that marcasite has an affinity for oil which the shale included, but which was burned out of the shale ash. The present invention, however, contemplates the use of shale or shale ash and where satisfactory the use of marcasite or iron pyrites or mixtures of the same or their equivalents.

"It has furthermore been determined that to every 100 lb. of the foregoing there may be added a waterproofing material in the form of specially prepared waterproofing compositions, or in the form of commercial waterproofing compositions now on the market, and the proportions of these may be varied as is well known in the art. For example, from 1 to 10 lb. of the same may be added to every 100 lb. of lime or lime equivalent material, but approximately 2 to 3 lb. of the waterproofing material seems to produce satisfactory waterproofing properties.

"The before-mentioned lime hardener therefore may be mixed with from 1 to 10 lb. of waterproofing material, although generally but 2 or 3 lb. of said material is included in the hardening compound, thereby forming a hardening and waterproofing composition.

"The invention therefore generically consists of a suitable shale material, an activating agent and a water absorbing agent.

"The invention claimed is:

"1. A composition for hardening commercial lime products such as plaster, mortar and stucco, including calcium oxide or calcium hydroxide or the like, said composition including a pulverized shale material including the ash content thereof, calcium chloride and a comminuted iron sulphur compound including only iron and sulphur.

"2. A composition as defined by claim 1, wherein the composition for approximately 100 lb. of lime in the lime product includes the approximate proportions of 1 lb. of shale material to at least 3 lb. of the $CaCl_2$.

"3. A composition as defined by claim 1, wherein the composition for approximately 100 lb. of lime in the lime product includes the approximate proportions of 1 lb. of the iron sulphur compound to at least 3 lb. of calcium chloride.

"4. A composition as defined by claim 1, wherein the composition for approximately 100 lb. of lime in the lime product includes approximately 1 lb. of shale material to at least 3 lb. of calcium chloride and 1 lb. of iron sulphur compound."

Canadian Fuels

THE ANNUAL report of the Canadian Mines Branch Investigations of Fuels and Fuel Testing (1927) is divided into two parts. Part I gives results of coking tests on coals of western Canada and Part II concerns the annual gasoline survey and laboratory assaying of bituminous sands.

Editorial Comment

Confusion of Tests

The public has heard much of the flexural strength of concrete in the past year or so and is likely to hear more of it in the future. But it would be able to understand the subject better and to make a more intelligent use of the results that come from various public and private laboratories if these results were obtained by identical methods of testing procedure.

The flexural strength of concrete is found by obtaining the modulus of rupture by breaking a beam of the concrete to be tested. There are three ways by which such beams are broken in the laboratory—third-point loading, center loading and cantilever loading. In third-point loading, the load is applied at two points which divide the length of the beam into thirds; in center loading the load is applied at the center and in cantilever loading the load is applied at one end, the other end being held fast. The results obtained by these three methods vary too much for the variations to be neglected in even the roughest calculations.

The methods have been studied by Gonnerman and Schuman, of the Portland Cement Association, and the results are given in the report of the director of research of the association for 1928. Third-point loading gives the lowest value for the modulus of rupture, center loading the next and cantilever loading the highest, for beams of most lengths and depths. But there are other variations than that due to the style of loading and these, or some of them, affect the different methods frequently. For example, varying the distance between thrust and support, in the cantilever test, from 3-in. to 12-in., raised the modulus of rupture from 720- to 835-lb. with a 7-in beam.

For a 7 by 10-in. beam (the size has always to be stated) the modulus of rupture, in pounds per square inch, found by third-point loading was about 700 lb.; with center loading it was a little over 800 lb., and with cantilever loading it was about 900 lb. This was with a 20-in. span; with a longer span the differences would have been less, with a shorter span they would have been more. Examples like this might be multiplied, but this is enough to show that the method of testing is all important in determining concrete flexural strength.

The Portland Cement Association's results in recently published tests have been obtained by third-point loading; the laboratories of the National Crushed Stone Association and the National Sand and Gravel Association use center loading in all their tests and the Bureau of Public Roads used cantilever loading in its recent comparative tests of coarse aggregates. The figures obtained in all of these are very interesting and they can be compared among themselves but they cannot be compared with one another.

Sub-Committee VII of the Committee on Concrete and Concrete Aggregates of the American Society for Testing Materials is studying methods for testing for flexural strength and reported at the June meeting that it would propose a tentative standard shortly. It is to be hoped that its work will be forwarded as fast as possible. So much research is being done and is to be done on the flexural strength of concrete and the properties of aggregates that it would be well to have a standard method used as soon as possible.

Don't Overlook This One!

Elsewhere in this issue the reader will find a contribution by Stanley M. Hands on "Winter Thoughts of an Aggregate Salesman." Whoever has aggregates to sell should read and study this. The author is not unknown to the industry. Mr. Hands was formerly with the state highway engineering department of Iowa, and then sales manager of the River Products Co., Iowa City, Ia., crushed-stone producers. With his expert knowledge of concrete-making he was able to sell knowledge and service as well as aggregates, and consequently was not greatly troubled by the lower prices of his competitors, since he knew how stronger and more economical concrete could be made with his aggregates at a higher, and a profitable, price. About a year ago he felt the urge of California (that state, they say, is largely populated with people from Iowa) and is now a member of the engineering staff of the California state highway department.

Therefore, Mr. Hands enjoys the probably unique distinction of being a concrete expert who has an entire understanding of the producers' problems, with consequent sympathy for the producer, and an entirely justified desire to see the producer make a profit. He believes sand and gravel and crushed-stone producers have much more in common than they sometimes think they have. He believes the aggregate producer should co-operate with the contractor, by and with the assistance of the engineer, to produce a *workable* concrete mixture. And to produce a workable concrete mixture Mr. Hands says a good slogan is: "Uniform materials, consistently made and consistently delivered." In other words, an aggregate that is uniform from day to day is far more desirable in view of practical considerations than one with a minimum of voids, or an otherwise specially designed grading. Such uniform aggregate material in the long run produces better concrete and is more profitable to the producer—the goal of all concerned, unless it be the engineer, and he can be educated! Once Mr. Hand's findings are recognized, that "bugaboo" of most aggregate producers, waste sizes (and as such unsalable material) will largely disappear.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[29]	12- 3-29	90	95	
Alpha P. C. new com.	12- 2-29	33	34	75c qu. Oct. 15
Alpha P. C. pfd.	12- 2-29	110	....	1.75 qu. Dec. 14
American Aggregates com.[29]	12- 3-29	30	50	75c qu. Mar. 1
Amer. Aggregate 6's, bonds	12- 3-29	90	....	
American Brick Co., sand-lime brick	12- 2-29	....	12½	25c qu. Feb. 1
American Brick Co. pfd., sand-lime brick	10-21-29	....	80	50c qu. Nov. 1
Am. L. & S. 1st 7's[28]	12- 3-29	96	98	
American Silica Corp. 6½'s[49]	12- 4-29	90	100	
Arundel Corp. new com.	12- 3-29	41	....	50c qu. Oct. 1
Atlantic Gyp. Prod. (1st 6's & 10 sh. com.)[10]	12- 4-29	No market		
Atlas P. C. com.	12- 2-29	34⅞	40	50c qu. Dec. 2
Beaver P. C. 1st 7's[20]	11-29-29	97	100	
Bessemer L. & C. Class A[4]	11-30-29	29	31	75c qu. Nov. 1
Bessemer L. & C. 1st 6½'s[4]	11-30-29	89	92	
Bloomington Limestone 6's[29]	12- 3-29	86	88	
Boston S. & G. new com.[47]	12- 2-29	17	20	40c qu. July 1
Boston S. G. new 7% pfd.[47]	12- 2-29	47	50	87½c qu. July 1
Calaveras Cement 7% pfd.	12- 2-29	80½	82	
Calaveras Cement com.	12- 2-29	13	17	
Canada Cement com.	12- 2-29	18¼	19	
Canada Cement pfd.	12- 2-29	92	93	1.62½ qu. Dec. 31
Canada Cement 5½'s[43]	11-29-29	97½	98¼	
Canada Cr. St. Corp. 1st 6½'s[43]	11-29-29	95	99	
Can. Gyp. & Alabastine (new)*	12- 2-29	23¼	23½	37½c qu. Oct. 1
Certainteed Prod. com.	12- 3-29	13⅝	14	
Certainteed Prod. pfd.	12- 3-29	55	58	1.75 qu. Jan. 1
Cleveland Quarries new st'k	12- 3-29	66	70	75c, 25c ex. Dec. 1
Columbia S. & G. pfd.	12- 3-29	80	88	
Consol. Cement 1st 6½'s, A[42]	12- 4-29	90	....	
Consol. Cement 6½% notes[24]	12- 4-29	88	93	
Consol. Cement pfd.[29]	12- 3-29	50	60	
Consol. Oka S. & G. 6½'s[12] (Canada)	11-23-29	98	100	
Consol. Rock Prod. com.[20]	11-29-29	2½	3½	
Consol. Rock Prod. pfd.[20]	11-29-29	15	18	
Consol. S. & G. com. (Can.)	11-18-29	15	....	
Consol. S. & G. pfd. (Can.)	12- 2-29	80	85	1.75 qu. Nov. 15
Construction Mat. com.	12- 3-29	19¼	19½	
Construction Mat. pfd.	12- 3-29	38½	40½	87½c qu. Nov. 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[18]	11-29-29	92	97½	
Coosa P. C. 1st 6's[29]	12- 3-29	50	55	
Coplay Cem. Mfg. 1st 6's[40]	12- 2-29	90	....	
Coplay Cem. Mfg. com.[40]	12- 2-29	10	....	
Coplay Cem. Mfg. pfd.[40]	12- 2-29	70	....	
Dewey P. C. 6's†[28] (1942)	12- 4-29	97	....	
Dewey P. C. 6's[28] (1930)	12- 4-29	97	....	
Dewey P. C. 6's[28] (1931-41)	12- 4-29	97	....	
Dolese & Shepard	12- 3-29	90	94	
Edison P. C. com.[39]	12- 2-29	10c	....	
Edison P. C. pfd.[39]	12- 2-29	25c	....	
Giant P. C. com.[2]	12- 2-29	....	25	
Giant P. C. pfd.[2]	12- 2-29	....	35	3½% s.-a. Dec. 16
Ideal Cement, new com.[33]	11-29-29	60	65	75c qu. Oct. 1
Ideal Cement 5's, 1943[33]	11-29-29	94	98	
Indiana Limestone units[29] (5 shs. com. & 1 sh. pfd.)	12- 3-29	105	....	
Indiana Limestone 6's	12- 2-29	77	77¼	
International Cem. com.	12- 3-29	62½	63	$1 qu. Dec. 31
International Cem. bonds 5's	12- 3-29	96⅛	97	Semi-ann. int.
Iron City S. & G. bonds 6's[40]	11-15-29	80	....	
Kelley Is. L. & T. new st'k	12- 3-29	44	45	62½c qu., 50c ex. Jan. 1
Ky. Cons. St. com. Voting Trust Certif.[48]	11-29-29	12	13	
Ky. Cons. Stone 6½'s[48]	11-29-29	95	98	
Ky. Cons. Stone pfd.[48]	11-29-29	89	93	
Ky. Cons. Stone com.[48]	11-29-29	12	13	
Lawrence P. C.	12- 2-29	55	65	$1 qu. Sept. 28
Lawrence P. C. 5½'s, 1942	11- 6-29	83	....	
Lehigh P. C.	12- 3-29	38½	39½	62½c qu. Nov. 1
Lehigh P. C. pfd.	12- 3-29	102½	105	1¾% qu. Jan. 2
Louisville Cement[48]	12- 3-29	250	....	
Lyman-Richey 1st 6's, 1932[18]	11-18-29	96	99	
Lyman-Richey 1st 6's, 1935[18]	11-18-29	95	98	
Marblehead Lime 6's[14]	11-30-29	95	100	
Marbelite pfd.	11-15-29	1¼	....	
Material Service Corp.	12- 3-29	24½	....	50c qu. Dec. 1
Medusa Portland Cem.[29]	12- 3-29	123	126	1.50 Oct. 1
Mich. L. & C. com.[6]	12- 2-29	35	....	
Missouri P. C.	12- 3-29	34¾	35	50c qu. 50c ex. Nov. 1
Monolith Midwest[9]	11-29-29	7½	8½	
Monolith bonds, 6's[9]	11-29-29	97	98	
Monolith P. C. com.[9]	11-29-29	12	13	40c s.-a. July 1
Monolith P. C. pfd.[9]	11-29-29	8½	9½	40c s.-a. July 1
Monolith P. C. units[9]	11-14-29	31½	33	
National Cem. (Can.) 1st 7's[29]	12- 3-29	93	96	
National Gypsum A com.	12- 3-29	8½	9½	
National Gypsum pfd.	12- 3-29	40	45	
Nazareth Cem. com.[26]	11-29-29	15	25	
Nazareth Cem. pfd.[26]	11-29-29	90	103	
Newaygo P. C. 1st 6½'s[29]	12- 3-29	101½	103	
New Eng. Lime 1st 6's[14]	11-30-29	95	100	
N. Y. Trap Rock 1st 6's	12- 3-29	94½	95	
North Amer. Cem. 1st 6½'s	12- 3-29	60¾	61	
North Amer. Cem. com.[29]	12- 3-29	3	6	
North Amer. Cem. 7% pfd.[29]	12- 3-29	20	25	1.75 qu. Aug. 1
North Amer. Cem. units[29]	12- 3-29	22	29	
North Shore Mat. 1st 5's[15]	12- 5-29	95	....	
Northwestern States P. C.[37]	7-26-29	140	....	2% Oct. 1
Ohio River Sand com.	12- 2-29	....	27½	
Ohio River Sand 7% pfd.	12- 2-29	99	102	
Ohio River S. & G. 6's[16]	12- 2-29	87	95	
Pac. Coast Agg. 6½'s[23]	11-14-29	99	....	
Pac. Coast Agg. 7's[23]	11-14-29	99	....	
Pac. Coast Cem. 6's, A[5]	10-17-29	....	95	
Pacific P. C. com.	12- 2-29	25	....	$2 Dec. 18
Pacific P. C. pfd.	12- 2-29	75	80	1.62½ qu. Oct. 5
Pacific P. C. 6's[5]	10-17-29	99¼	100	
Peerless Cem. Corp. com.[21]	11-18-29	1	2½	20c Dec. 20
Peerless Cem. Corp. pfd.[21]	11-18-29	80	85	1.75 Dec. 31
Penn-Dixie Cem. 1st 6's	12- 3-29	75	75⅛	
Penn-Dixie Cem. pfd.	12- 3-29	36	40	1.75 qu. Sept. 15
Penn-Dixie Cem. com.	12- 3-29	8½	9	
Penn. Glass Sand Corp. 6's	11- 6-29	101	103	
Penn. Glass Sand pfd.	10- 9-29	115	....	1.75 qu. Oct. 1
Petoskey P. C.	12- 3-29	....	10	1½% qu. Sept. 1
Riverside P. C. com.	12- 2-29	....	20	
Riverside P. C. pfd.[20]	11-29-29	75	85	1.50 qu. Nov. 1
Riverside P. C., A[20]	11-29-29	13	17	31¼c qu. Nov. 1
Riverside P. C., B[9]	11-29-29	5	....	
Santa Cruz P.C. 1st 6's, 1945‡	12- 2-29	108½	....	6% annually
Santa Cruz P. C. com.	12- 2-29	95	....	$1 qu. Oct. 1
Schumacher Wallboard com.	12- 2-29	8½	10	
Schumacher Wallboard pfd.	12- 2-29	20	24	50c qu. Nov. 15
Southwestern P. C. units[44]	11-14-29	270	....	
Standard Paving & Mat. (Can.) com.	12- 2-29	25	26	50c qu. Nov. 15
Standard Pav. & Mat. pfd.	12- 2-29	89	....	1.75 qu. Nov. 15
Superior P. C., A	12- 2-29	37½	39	27½c mo. Jan. 1
Superior P. C., B	12- 2-29	12½	14	
Trinity P. C. units[37]	7-26-29	142	150	
Trinity P. C. com.[37]	7-26-29	51	....	
Trinity P. C. pfd.[29]	12- 3-29	112	117	
U. S. Gypsum com.	12- 3-29	45	45½	2% qu. Dec. 31
U. S. Gypsum pfd.[29]	12- 3-29	125	128	1¾% qu. Dec. 31
Universal G. & L. com.[8]	12- 4-29	No market		
Universal G. & L. pfd.[8]	12- 4-29	No market		
Universal G. & L., V.T.C.[8]	12- 4-29	No market		
Universal G. & L. 1st 6's[8]	12- 4-29	No market		
Warner Co. com.	12- 2-29	39⅛	39⅞	50c qu., 50c ex. Jan. 15
Warner Co. 1st 7% pfd.[16]	12- 2-29	95	100	1¾% qu. Jan. 15
Warner Co. 1st 6's[8]	12- 4-29	97	100	
Whitehall Cem. Mfg. com.[36]	10-31-29	125	....	
Whitehall Cem. Mfg. pfd.[36]	10-31-29	98	....	
Wisconsin L. & C. 1st 6's[15]	12- 4-29	95	....	
Wolverine P. C. com.	12- 3-29	4½	6	15c qu. Nov. 15
Yosemite P. C., A com.[20]	11-29-29	2½	3	

†$484,000 called for redemption at 103½ October 1. *Dividend equivalent to $6 per share per annum on old capital stock recently split up on a 4 for 1 basis and on which quarterly dividends of 75c per share were paid. ‡Entire issue called for redemption at 110, March 1, 1930.

[1]Quotations by Watling Lerchen & Hayes Co., Detroit, Mich. [2]Quotations by Bristol & Willett, New York. [3]Quotations by Rogers, Tracy Co., Chicago. [4]Quotations by Butler Beadling & Co., Youngstown, Ohio. [5]Quotations by Freeman, Smith & Camp Co., San Francisco, Calif. [6]Quotations by Frederic H. Hatch & Co., New York. [7]By J. J. B. Hilliard & Son, Louisville, Ky. [8]Quotations by Dillon, Read & Co., Chicago, Ill. [9]Quotations by A. E. White Co., San Francisco, Calif. [10]Quotations by Lee Higginson & Co., Boston and Chicago. [11]Nesbit, Thomson & Co., Montreal, Canada. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Peters Trust Co., Omaha, Neb. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co., of Illinois, Chicago. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Chas. W. Scranton & Co., New Haven, Conn. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hoit, Rose & Troster, New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simons & Co., Inc., Detroit, Mich. [22]Hemphill, Noyes & Co., New York City, N. Y. [23]California Co., Los Angeles, Calif. [24]A. B. Leach & Co., Inc., Chicago, Ill. [25]Richards & Co., Philadelphia, Penn. [26]Hincks Bros. & Co., Bridgeport, Conn. [28]Bank of Republic, Chicago, Ill. [29]National City Co., Chicago, Ill. [30]Chicago Trust Co., Chicago, Ill. [33]Boettcher Newton & Co., Denver, Colo. [36]Hanson and Hanson, New York. [37]S. F. Holzinger & Co., Milwaukee, Wis. [38]McFetrick & Co., Montreal, Quebec. [39]Tobey and Kirk, New York. [40]Steiner, Rouse and Stroock, New York. [41]Hornblower & Weeks, New York City and Chicago. [42]E. H. Rollins, Chicago, Ill. [43]Jones, Heward & Co., Montreal, Que. [44]Tenney, Williams & Co., Inc., Los Angeles, Calif. [46]Stein Bros. & Boyce, Baltimore, Md. [47]Wise, Hobbs & Arnold, Boston. [48]E. W. Hays & Co., Louisville, Ky. [49]Blythe Witter & Co., Chicago, Ill.

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
American Brick Co. pfd., 50 sh.[5] (par $25) per sh.	22½ ex-div.	....
American Brick Co. com., 20 sh.[8]	$10 per share	....
American Brick Co. pfd., 20 sh.[8] (par $25)	$18 per share	....
Atlantic Gypsum Prod. Co. pfd., 750 sh.[10]	$10 per share	....
International Portland Cement Co., Ltd., pfd.	30	45
New England Lime Co. Series B 60 sh.[9]	$15 per share	....
Southern Phosphate Co.[6]	1¼	....
Universal Gypsum com. free stk.[1] 300 shares	$75 for the lot	....
Vermont Milling Products Co. (slate granules), 22 sh. com. and 12 sh. pfd.[6]	$1 for the lot	....
Winchester Rock Brick Co., pfd., 1 share (par $25) and 1 share com. (par $10)[6]	$8 for the lot	....

[5]Price at auction by R. L. Day & Co., Boston, October 23, 1929. [6]Price at auction by Wise, Hobbs & Arnold, Boston, Mass., June 19, 1929. [8]Price at auction by Wise, Hobbs & Arnold, Boston, October 16, 1929. [9]Price at auction by R. L. Day & Co., Boston, October 16, 1929. [10]Price at auction by R. L. Day & Co., Boston, November 6, 1929.

Oregon Portland Cement Pays Common Dividend

ON ITS OUTSTANDING 71,515 shares of no par value common stock, Oregon Portland Cement Co., Portland, Ore., paid a 50 c. per share cash dividend to stockholders of record November 15. This is the first dividend on common stock paid since the merger of Oregon-Portland and Sun Cement companies in September, 1926.

This dividend is being paid in the face of an estimated 250,000-bbl. decline in Oregon consumption of cement for 1929. Last year the state used approximately 1,243,000 bbl. This year consumption may not touch 1,000,000 bbl., due largely to quiescent condition of new construction.

The Oregon Portland Cement Co. common dividend is being paid partly from earned surplus and partly from current earnings, L. C. Newlands, president, advises. During 1929 the company, through open market purchases, retired $30,600 of its first cumulative preferred stock; it added a very substantial sum to its depreciation reserve, paid dividends due on both classes of its preferred stock and retired, in accord with terms of the Sun company merger, 2% of outstanding 7% convertible preferred stock. Retirement of last-named preferred stock is $14,000 ahead of schedule. — *Chapman's Financial Weekly.*

Gypsum Business Helps Certain-teed Products Lose Money

ANNOUNCING a net los of $50,299 for the quarter ended September 30, and a consolidated net loss for the nine months ended September 30 of $715,777, President George M. Brown, of the Certain-teed Products Corp., New York City, said (in part) to stockholders:

"After 24 years of successful business the company had its first year showing a loss in 1928. Prices began to show heavy declines in roofing and gypsum lines early, and during May we decided to announce firm prices in roofing to be held throughout the year, regardless of competitive prices, hoping that stabilization might be secured by similar action on the part of all others. Our hopes were not realized, so we suffered enormously from loss of volume in roofing. We had a worse situation in gypsum products. It would have been much better for our business if we had met all prices freely throughout that period and held our volume at competitive prices.

"With the opening of this year the company's policy was put back on the basis of meeting prices freely with a determination to give our customers proper price protection and recover our trade lost during the preceding months. The lowest prices were met in both the roofing and gypsum lines, but efforts were made to avoid adding to the demoralization by making any new prices below prices being made by competition. We recovered our lost volume, making a new high record for units of sales in our roofing division for the first half of any year. Lesser efforts were put on gypsum and our recovery of volume in that line during that period was of a lesser degree. Prices in these two divisions were often made which were substantially below the cost of material and labor for the goods sold. Gypsum prices showed the largest percentage of decline.

"About the middle of this year there were indications that producers were beginning to realize that better prices must be secured, that price cutting could not go on indefinitely and was getting nowhere. As a result there began to be a firmer tendency in prices which have recovered at this time to a point where on the basis of our present selling prices, which are holding well, and on a volume of sales equal to the average of the years 1927, 1928 and 1929, the company would earn on a year's business, as shown by actual check, more than $4 a share on its common stock.

"The fourth quarter's business this year will be affected by old commitments at some of the former prices and by the necessity for having the trade finally digest its overpurchases earlier in the year, while the extremely low prices prevailed. A slight profit in excess of depreciation and bond interest was made in September, and October shows improved shipping over September.

"We may have some loss in volume, due to a letdown in total business in some of our lines for next year, but we anticipate that still better prices will also be established and that we may look forward to a satisfactory year, with a fair expectation of having it become the most satisfactory year we have ever had. We now estimate that our net earnings will be sufficient to justify us in paying up all accumulated dividends on the preferred stock during the second half of next year, but no payments should be expected on the common, regardless of its earnings, until after a substantial accumulation of earned surplus.

"The stock holdings of the company officials and others most closely associated with the management of the company have generally been retained or increased throughout these price war periods and are today at highest figures. I have ample confidence in the future of our company."

International Cement Earnings

THE International Cement Corp., New York City, reports a net income of $3,805,582 after all charges, including federal taxes, for the 10 months ended October 31. This is equal to $6.06 a share on 627,524 shares of common stock outstanding.

Consolidated Rock Products Co. Preferred Dividend

CONSOLIDATED ROCK PRODUCTS CO., Los Angeles, has voted its third quarterly dividend of 43¾ cents a share on the 300,000 shares of preferred stock outstanding. Announcement of the dividend was made following the regular meeting of the board of directors. Totaling $131,250, the dividend will be paid to about 2500 stockholders of record November 15, 1929. Organized in February of the current year by Lee A. Phillips, chairman of the board of Pacific Finance Corp., the Consolidated company has enjoyed the steady progress which marked the development of the companies merged to form it, the Union, Consumers and Reliance rock and gravel units. It owns and operates 24 producing plants and 21 bunkers, with a capacity of approximately 8,000,000 tons of rock, sand and gravel a year.—*Los Angeles* (Calif.) *Examiner.*

Canada Paving and Supply Company Financing

McLEOD, YOUNG, WEIR AND CO., investment bankers, Toronto, Ont., are offering $2,000,000 in 7% cumulative, sinking fund, convertible, first preference shares (par value $100) in the Canada Paving and Supply Co., Windsor, Ont., which has extensive sand and gravel producing facilities. The following data is from a letter signed by Louis A. Merlo, president of the company:

BUSINESS—The Canada Paving and Supply Corp., Ltd., has been incorporated under letters patent of the Province of Ontario and, through ownership of all their stock or assets, will control Merlo, Merlo and Ray, Ltd.; Essex Transit Co., Ltd.; River Sand Brick Co., Ltd.; Chick Contracting Co., Ltd.; Chick Fuel and Supply Co., Ltd.; Wm. Woollatt and Sons, Ltd.; Ryan Construction Co., Ltd.; Cross Builders Supply Co., Ltd.; Premier Construction Co., Ltd.; Border Builders Supplies, Ltd., and Cast Stone Block and Machine Co., Ltd. All of these concerns have their headquarters in the Border Cities, a group of urban municipalities consisting of Windsor, Walkerville, Ford, Sandwich, Riverside, Tecumseh, La Salle and Ojibway, located on the Canadian side of the Detroit river, and constituting the most rapidly growing urban area in Canada. The corporation, whose wholly-owned subsidiaries are long-established and favorably known, dominates the contracting and builders' supply business in this area and in the adjacent southwestern peninsula of Ontario. Among the activities engaged in are contracting for pavements, sewers, water mains, gas mains, buildings, foundations and excavations, sale and transport of sand and gravel, gravel dredging, manufacture of sand brick, concrete blocks and artificial stone, and the sale of coal, wood, coke, cement, lime and builders' supplies generally.

Extensive gravel deposits at Pt. Edward and Leamington, estimated to contain more than 13,000,000 cu. yd., have been made exclusively available to the corporation at a favorable price by the Windsor Sand and

Gravel Co., Ltd. The corporation has entered into contracts whereby it is estimated it will acquire complete stock ownership of Windsor Sand and Gravel Co., Ltd., within a period of seven years without any expenditure beyond the fair price of sand and gravel taken by the corporation from the abovementioned properties.

PROPERTIES—The corporation, through its subsidiaries, owns three, and also holds under long-term renewable leases from the Michigan Central railroad, two well-equipped gravel docks in Ford and Windsor, builders' supply, contractors' and fuel yards, a modern brick plant, asphalt plant, artificial stone and cement block plants, sand and gravel boats, steam shovels, trucks and complete contractors' and paving equipment.

ASSETS—The fixed assets of the corporation and its subsidiaries have been appraised by the Sterling Appraisal Co., Ltd., at $2,526,314. Net tangible assets as at December 1, 1928, are certified by Price Waterhouse and Co. and Brokenshire, Scarff and Co., chartered accountants, on the appended balance sheet at $3,526,314, equivalent to $176 for each first preference share to be presently outstanding. Current assets are certified at $1,552,447 and current liabilities at $552,447, leaving working capital of $1,000,000, and giving a working capital ratio of approximately 3 to 1.

EARNINGS—For the three years and 11 months ended November 30, 1928, net earnings after providing for depreciation and income taxes are certified by Price Waterhouse and Co. and Brokenshire, Scarff and Co., this averaging $401,300 per annum. This is equivalent to $20 on each first preference share to be presently outstanding. For the 11 months ended December 1, 1928, such net earnings were similarly certified at $463,590 or $23.17 on each first preference share.

Net earnings available for the common stock for eleven months ended December 1, 1928, were equivalent to $4.14 a share.

SINKING FUND—A sinking fund of 20% of net earnings after providing for depreciation, income taxes and dividends on the first and second preference shares is provided for the purchase and redemption of these shares at not exceeding 110 and accrued dividends.

CONVERSION PRIVILEGE—These shares are convertible at any time at the option of the holder into no-par value common shares on the basis of three common shares for each first preference share.

Shares called for redemption may be converted into common shares at any time on or before the date fixed for redemption.

REDEMPTION—The corporation may, on giving 60 days' notice, redeem all or part of the outstanding first preference shares at not exceeding 110 and accrued dividends.

PROTECTIVE PROVISIONS—Without the consent of 66⅔% of the holders of first preference shares or the approval of 75% of the votes cast at a meeting at which at least half of the outstanding first preference shares are represented,—

(1) No additional shares ranking in priority to or on a parity with the first preference shares may be created;

(2) No shares of any other class than no-par value common shares may be authorized;

(3) The property of the corporation or any of its subsidiaries may not be encumbered except by means of (a) purchase money mortgages or other purchase money liens on after-acquired property or the renewing or refunding of same or (b) the pledging of liquid assets in the ordinary course of business; or (c) security given to bankers under the bank act or otherwise;

(4) The privileges or restrictions applying to these shares may not be altered or suspended;

(5) Any stock dividends may not be declared, any profits capitalized by issuing shares of capital stock, any of the shares subdivided, nor any common shares issued (except for conversion of first or second preference shares) for a net consideration of less than $33⅓ per share in cash or other consideration taken at the fair value thereof.

No dividends may be paid on any shares junior to the first preference shares unless (a) all accrued first preference share dividends have been paid (b) sinking funds provisions on these shares have been met and (c) net tangible assets, after providing for dividends on such junior shares, are in excess of $3,475,000 and net current assets in excess of a sum equal to 20% of net tangible assets or in excess of $1,000,000, whichever sum shall be the greater.

The holders of these shares have the right to elect a majority of the directors in the event of four quarterly dividend installments being in arrears or on default in sinking fund payments, such right to continue so long as such default exists. Otherwise these shares carry no voting rights.

PURPOSE OF ISSUE—The proceeds of this issue will be used in part to purchase the assets or stock of the subsidiary companies.

As a result of this financing, additional funds have been made available to the subsidiary companies for the extension of the corporation's activities to other provinces than Ontario.

SECOND PREFERENCE SHARES—Each second preference share is convertible at any time at the option of the holder into no-par value common stock on the basis of four shares of common stock for each second preference share, and carries the right to one vote.

Subject to the rights attaching to the first preference shares, the second preference shares are entitled to non-cumulative preferential dividends at the rate of 6% per annum, and are preferred as to assets in distribution to the extent of $100 per share and declared and unpaid dividends.

MANAGEMENT—The executives who have made successes of the business of the several companies which are now subsidiaries of the corporation will be in active charge. The management and interests identified with it control the corporation through stock ownership and have also purchased a substantial block of the first preference shares.

DIRECTORS—The board of directors consists of Thomas Chick, chairman of the board; Louis A. Merlo, president and managing director; John D. Chick, D. Herbert Woollatt, B. Sc., and George Cross, vice-presidents; Isaac Lambert, secretary-treasurer; John H. Ray, Leo J. Ryan, and D. I. McLeod representing the bankers underwriting this issue.

PROSPECTS—The corporation may be expected to grow and prosper with the growth and prosperity in the cities in which it operates. The border cities have had very rapid growth, and indications are that this will continue. The population increased from 23,771 in 1911 to 57,960 in 1921, and to 115,000 in 1928.

The district is a natural location for United States industries desiring to establish branches in Canada.

CONSOLIDATED BALANCE SHEET OF CANADA PAVING AND SUPPLY CORP., LTD., AND CONSTITUENT COMPANIES, AS AT DECEMBER 1, 1928, AFTER GIVING EFFECT TO:

(a) Incorporation of Canada Paving and Supply Corp., Ltd.

(b) Acquisition by it of all the outstanding capital stocks of the companies enumerated in the certificate below.

(c) Application of funds being provided, in discharge of existing mortgages, etc.

ASSETS

Net current assets:	
Stocks of materials and supplies and work in progress at approximate cost	$ 275,082.56
Accounts and bills receivable, less reserves	862,286.56
Deposits on tenders	37,975.00
Victory bonds	4,500.00
Cash surrender value of life insurance policies	13,954.00
Cash, including cash to be received from vendors under contracts, and application thereof in payment of existing bank loans	345,101.48
Prepaid insurance premiums, etc.	13,547.87
	$1,552,447.47
Deduct—Accounts and bills payable	552,447.47
Net current assets	$1,000,000.00
Property, plant and equipment:	
At appraised present value on November 30, 1928, reported by Sterling Appraisal Co., Ltd.	2,526,314.13
	$3,526,314.13

LIABILITIES

Capital and surplus:	
7% cumulative sinking fund convertible preference shares, authorized and to be issued	$2,000,000.00
6% non-cumulative redeemable convertible second preference shares, authorized and to be issued	1,250,000.00
Common stock and surplus (authorized 170,000 shares) represented by 60,000 shares without nominal or par value, to be presently outstanding	276,314.13
	$3,526,314.13

Idaho Portland Dividends Soon

According to E. J. Simons, president of the Idaho Portland Cement Co., Pocatello, the first dividends to stockholders will be paid about January 1, 1930. The company went into operation in May, 1929.

Sustained demand for cement in the district has made full-capacity operation necessary, Mr. Simons stated. He said further that the plant in all probability will be in operation the entire winter. — *Spokane* (Wash.) *Spokesman-Review.*

Erratum

In the November 23 issue of Rock Products, page 92, it was stated in error that the 6% notes of the Petoskey Portland Cement Co., Petoskey, Mich., in amount of $200,000 were due December 1, 1929. This particular issue, however, has been retired, and the new issue for $150,000 is due on the first of August of each year for ten years starting August 1, 1929.

Recent Dividends Announced

Alpha P. C. pfd. (qu.)	$1.75	Dec. 14
Giant P. C. pfd. (semi-ann.)	3½%	Dec. 16
International Cement com. (qu.)	$1.00	Dec. 31
Pacific P. C. com.	$2.00	Dec. 18
Superior P. C. Cl. A. (mo.)	27½c	Jan. 1
Warner Co. com. (qu.)	50c	Jan. 15
Warner Co. com. (extra)	50c	Jan. 15
Warner Co. 1st pfd. (qu.)	$1.75	Jan. 15
Warner Co. 2nd pfd. (qu.)	$1.75	Jan. 15

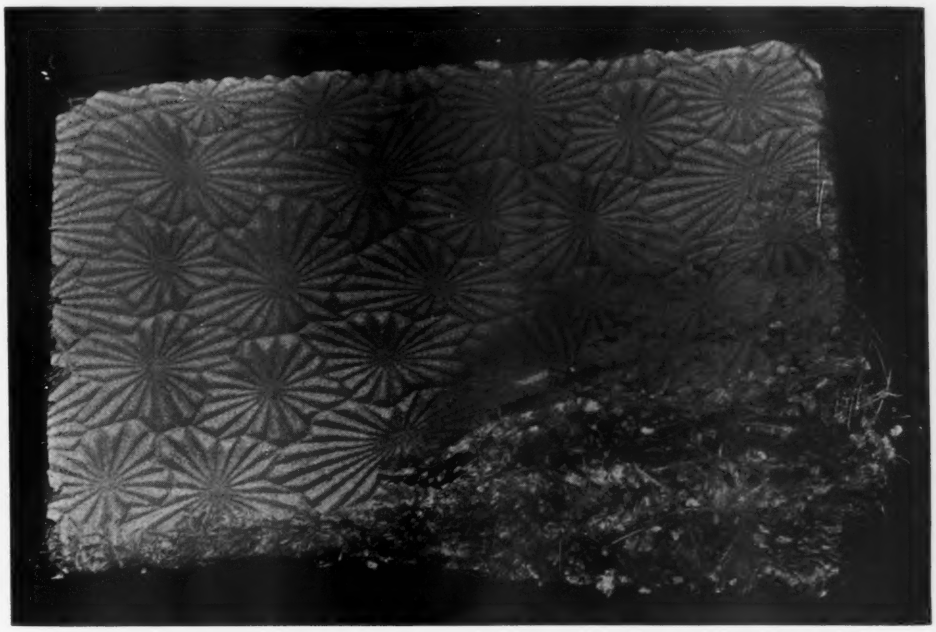
Australian Gypsum Wallboard

IT IS ALWAYS INTERESTING to note the kinds of wallboard manufactured in other countries, and intensely so when the manufacturing company is located in the far distant West Australia. It is with no little pride that we mention that Rock Products was chosen by the Ajax Plaster Co., Ltd., 520 Murray St., Perth, West Australia, as an American publisher to select for them literature dealing with gypsum and wallboard subjects.

The managing director, B. Meecham, sent several samples of wallboard, reproductions of which accompany this note. A sample of their "seed" gypsum was also included.

There are several striking features in connection with the wallboard, the main one being the beauty of the execution of the intricate design on the wallboard's outer face. The photograph does not bring out the luster nor illustrate it's possibilities as a medium of artistic expression, a thing that is totally lacking in American made wallboards.

One can readily understand how this board could be used on walls and ceilings, either with a hardwood batten or joints covered with plaster, and easily make a wall far superior in appearance to the ordinary hard-wall plaster.



The amount of fiber used in their wallboard is evident from this illustration

The samples do not have either face backed with paper, but rely on the gypsum and the long sisal fiber for strength. It is also noteworthy with respect to the amount of long fiber present, as the amount of fiber is so great that the board could almost be classed as a "sisal board" with gypsum acting merely as a filler. It is impossible to break the board, in the same manner that American wallboard can be broken, due to

It is seldom that a wallboard is seen whose outer surface has such a striking appearance as these two samples of Australian manufacture

the amount of fiber present. The illustration will give some idea as to the amount present, as it can be seen how the fibrous layers could be separated.

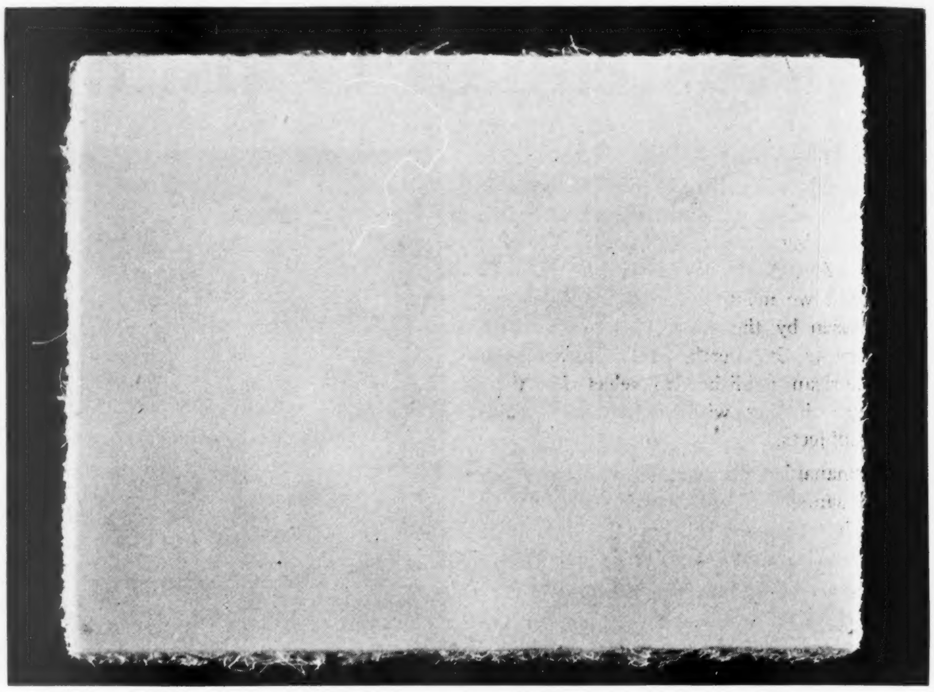
Mr. Meecham does not state how this wallboard is made, but he is anxious to secure information on American gypsum practices and to keep abreast of the times. His calcining plant at present is called on to produce only about 50 tons per week, but he feels that the industry is in its infancy in Australia and that it will not be long before remodeling of their plant will be necessary to take care of the increased uses and demand for gypsum. So far gypsum tile has not been manufactured in Australia, nor has wallboard or plaster board of the type as we know it here in the United States.

At present the Ajax Plaster Co., Ltd., turns out only one kind of plaster for general plastering purposes. Wallboard manufacturers apparently prefer to add their own accelerator or retarder to calcined gypsum.

The samples of wallboard were made by Ceiloyd, Ltd., Milton St., Perth, in graded sizes of from 5 ft. to 9 ft. long and 3 ft. 6 in. to 4 ft. 6 in. wide. Plain sheets are quoted at 2/6 per sq. yd. (61 c.) and fancy sheets at 5/6 per sq. yd. ($1.32) with an extra crating charge of 6 c. per sq. yd. when shipped to country centers. The wallboard is marketed under the trade name "Ceiloyd."

The Ceiloyd factory also manufactures and markets gypsum ornamental objects such as center flowers, fancy center panels and decorative devices to go around ventilators, cornices, etc.

The sample of gypsum received is what they call "seed" gypsum and resembles somewhat the gypsum sands near Alamogordo, New Mexico, but is more crystalline and needle-like in structure. The sample was labeled "washed gypsum," so apparently the material contains soluble salts that are removed prior to calcining. The communication states that there is no rock gypsum in the state, but there are large quantities of the "seed" gypsum.



Snow white in color and without paper backing are unusual features for the Australian gypsum wallboard

Big Gravel Season in the La Grange, Mo., District

SAND and gravel shipments from the La Grange, Mo., district are reported to be the heaviest since the banner year of 1925, over 6300 cars having been shipped during the 1929 season. Of this total the Missouri Gravel Co., which pumps its product from the bed of the Mississippi river, has shipped 3795 railway carloads besides 56 barge loads, equivalent to 224 carloads, a total of 4019 carloads. This is an increase over last year's output, when 3798 carloads and 46 barge loads were shipped. The O'Dell company, operating a state-owned pit, shipped 98,000 tons of gravel and 17,000 tons of sand, equivalent to about 2300 cars.

Practically all the sand and gravel shipped by these plants has gone into highway construction excepting what was shipped by barge by the Missouri company to the company putting in the foundation of Quincy's Memorial bridge. The Missouri company shipped most of its products to contractors in Missouri, a considerable part to Illinois and some to Iowa.

The Missouri company is building a large new plant on a tract owned by the state which it will operate in 1930 under a 5-year lease.—*La Grange* (Mo.) *Indicator.*

County Co-operation Pledged Blue Diamond in Rebuilding of Corona Plant

BOTH the county of Riverside and the city of Corona, Calif., have assured the Blue Diamond Materials Co. that they will cooperate in every way possible in the rebuilding of the crushed rock plant near Corona. The county board of supervisors authorized the construction of the road from the Temescal highway to the plant from the road funds available for use in his district. Further assurance was given the company some time ago that the county would be in the market for the product whenever the plant, which was burned down some time ago, is rebuilt. —*Corona* (Calif.) *Independent.*

Feldspar Grinders' Institute Inaugurates Credit Bureau

INAUGURATION of a credit bureau within the institute was announced at the recent two-day meeting of the Feldspar Grinders' Institute at Atlantic City, N. J. The bureau will function as a general exchange for credit information and a credit committee is setting up a system for the handling of credit matters through the office of the institute so that it may become effective as of January 1, 1930.

The gathering was addressed by Henry P. Fowler, assistant manager of the research department of the United States Chamber of Commerce, who told of the work of the Federal Trade Commission and described in detail the things to be accomplished by a trade practice conference.

Following Mr. Fowler's address, G. W. Wray of the National Bureau of Standards gave a resume of what has been done on commercial standards through the Bureau of Standards since 1923. He made various suggestions for the standardization of grades of feldspar, mesh, standard method of test, etc., and commented on the report of the classification and standards committee of the institute and complimented the committee for their comprehensive report and the forward step they had taken in the beginning of this work. H. H. Steidle, also of the Bureau of Standards, described in detail the activity of his organization. A conference is being planned at the office of the Bureau to which all interested are invited. The standards will be discussed.

Southern Builders' Supply Association Convention

AN INTERESTING program has been arranged for the eleventh annual convention of the Southern Builders' Supply Association to be held at the Hotel Peabody, Memphis, Tenn., on December 9 and 10, 1929. A number of southern rock products operators are members of the association and prominent in its affairs.

Cement Association Plans Long Series of Safety Meetings for 1930

Fifteen Regional Conferences to Reach Almost All Sections

ANNOUNCEMENT has just been made by the Portland Cement Association, through its committee on accident prevention and insurance, of the fourth annual series of regional safety meetings conducted jointly with the cement section of the National Safety Council and with the co-operation of the United States Bureau of Mines.

During 1927 eight regional meetings were held, in 1928 that number was increased to 12; further demands made necessary the holding of 14 meetings in 1929 and during the coming year the committee has decided that 15 meetings will be required to extend the advantages of its plan to all of the plants which desire them.

The purposes of these meetings have been stated as (1) to provide opportunity for the foremen and their more responsible workers to secure safety information, viewpoint and enthusiasm, all necessary for the effective furthering of accident prevention work in their plants; (2) to provide opportunity for these men to contribute to this knowledge from their own accumulated experience, and (3) to secure general co-operation throughout the industry in plans for the country-wide safety campaigns of the Portland Cement Association.

During 1929 about 2,000 men attended the fourteen meetings, about one out of every 21 men employed in the operating departments of the industry. An effort is made to select plant representatives very carefully in order to send the men of real influence and ability in directing and leading others.

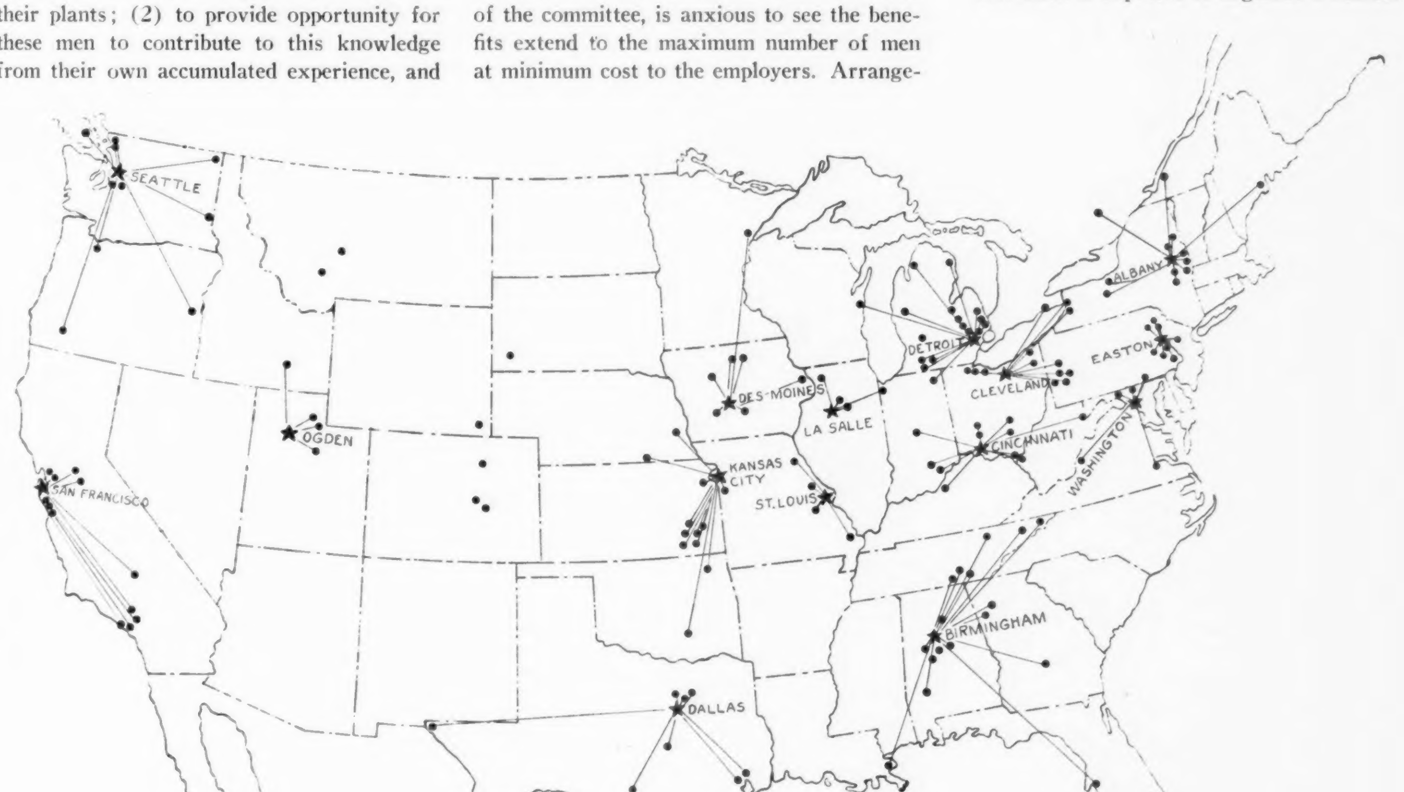
J. B. John, chairman of the committee on accident prevention and insurance of the Portland Cement Association, is largely responsible for the comprehensive schedule for 1930, in which it is hoped the attendance of mill men will be considerably increased and the expense of the meetings per man decreased. Mr. John believes that in these meetings the industry has a most effective vehicle for making its safety work more effective and he, as well as other members of the committee, is anxious to see the benefits extend to the maximum number of men at minimum cost to the employers. Arrangements for the forthcoming meetings are being made with these thoughts in view.

The schedule of meetings has been announced as follows:

Birmingham, January 22

The first meeting of the series will be held at the Tutwiler hotel, Birmingham, January 22. There will be morning and afternoon sessions, starting at 10 a. m. and 2 p. m. H. O. Underhill, superintendent of the Morton plant of the Alpha Portland Cement Co. at Birmingham, will act as general chairman, assisted by several committees. Mr. Underhill has been superintendent of this plant since it was built several years ago and was the first superintendent to operate 343-ft. kilns. The state insurance department of Alabama will be represented by R. M. Thigpen and the U. S. Bureau of Mines by its district engineer at Birmingham, F. E. Cash.

Mr. Cash is expected to organize a contest



Location of proposed regional safety meetings in 1930, and participating cement mills

of first-aid teams in which the mill organizations of the Alpha, Florida, Lehigh, Lone Star and Pennsylvania-Dixie mills in the southeastern states will participate. A great deal of rivalry exists between the three teams which competed at a former Birmingham regional meeting and therefore a lively contest is expected on January 22. Perkins J. Prewitt, managing director of the Birmingham safety council, is extending his personal assistance in making the forthcoming meeting an unqualified success. Major H. A. Reninger, recent president of the National Safety Council, will be present to discuss safety progress in the cement industry.

Mills which are expected to co-operate in the Birmingham meeting are:

Alpha Portland Cement Co., Birmingham, Ala.; the Atlas Portland Cement Co., Leeds, Ala.; Florida Portland Cement Co., Tampa, Fla.; Lehigh Portland Cement Co., Birmingham, Ala.; Lone Star Cement Co. (Alabama), Birmingham and Spocari, Ala.; Lone Star Cement Co. (Louisiana), New Orleans, La.; Pennsylvania-Dixie Cement Corp., Kingsport, Tenn., Clinchfield, Ga., and Chattanooga, Tenn., and Southern States Cement Co., Rockmart, Ga.

Dallas, February 4

On Tuesday, February 4, the cement mills of Texas will hold their third annual safety meeting at Dallas. As usual, all of the sessions will be held in the Baker hotel. Lewis R. Ferguson, vice-president and general manager of the Lone Star Cement Co. (Texas), located at the general offices of the company in Dallas, will act as general chairman. Mr. Ferguson, who was formerly vice-president of the Louisiana Portland Cement Co., and was at one time assistant to the president of the International Cement Corp., is well known for his interests in the individual safety movement. A large attendance is anticipated, representatives of two new mills, the Atlas at Waco and the Republic of San Antonio, being expected in addition to those representing the Lone Star, Southwestern and Trinity mills located in the state. Sessions will be held at 10 a. m. and 2 p. m. and there will be a dinner at 6:30 p. m. which will be attended by the leading executives.

Daniel Harrington, chief engineer of the U. S. Bureau of Mines, has designated District Engineer Alexander U. Miller, one of the most experienced members of his staff, to co-operate in organizing a first aid contest or demonstration. C. J. Crampton, manager of the Dallas Safety Council, is also to co-operate.

The complete list of mills expected to be represented is as follows:

The Atlas Portland Cement Co., Waco, Tex.; Lone Star Cement Co. (Texas), Dallas and Houston, Tex.; Republic Portland Cement Co., San Antonio, Tex.; San Antonio Portland Cement Co., San Antonio, Tex.; Southwestern Portland Cement Co., El Paso, Tex., and Trinity Portland Cement Co., Dallas, Fort Worth and Houston, Tex.

Cincinnati, February 11

For the first time, the association is to hold a regional safety meeting in Cincinnati. To it will come the mills of Indiana and Kentucky which participated in the meeting at Louisville this year, and also several of the Ohio and West Virginia mills which were represented at the 1929 meeting at New Castle, Penn.

The meeting will be held in the Italian room at Hotel Gibson on February 11. There will be both morning (10 a. m.) and afternoon (2 p. m.) sessions, with a special dinner in the evening. W. W. Hamilton, safety director of the Alpha Portland Cement Co. at Easton, Penn., who was formerly chief engineer at the Ironton (Ohio) plant of that company, will act as general chairman. A number of plant superintendents will assist Mr. Hamilton in perfecting program features.

J. F. Davies, safety engineer of the U. S. Bureau of Mines, has been assigned to co-operate in the expected first-aid contest and Thomas P. Kearns, superintendent of the safety division of the Ohio State Industrial Commission, will be present to represent the organized safety activities of the state. A number of local industrial safety leaders are being invited to be present.

The following mills are expected to participate:

Alpha Portland Cement Co., Ironton, Ohio, and Manheim, W. Va.; Kosmos Portland Cement Co., Kosmosdale, Ky.; Lehigh Portland Cement Co., Mitchell, Ind.; Lone Star Cement Co. (Indiana), Greencastle, Ind.; Louisville Cement Co., Speed, Ind.; Southwestern Portland Cement Co., Osborn, Ohio, and Wellston Iron Furnace Co., Wellston, Ohio.

St. Louis, February 25

St. Louis gets a regional safety meeting for the first time in 1930, the former territory covered by the LaSalle meeting having been split, in order to give the eastern Missouri mills a meeting near enough to permit large attendance. The St. Louis meeting will be held at the Hotel Coronado on February 25. There will be morning (10 a. m.) and afternoon (2 p. m.) sessions with dinner.

Hiram Norcross, vice-president and general manager of the Missouri Portland Cement Co., has accepted the chairmanship and is being assisted by a competent committee. C. A. Herbert, U. S. Bureau of Mines engineer in charge of the bureau station at Vincennes, Ind., has been secured to assist in organizing the first aid part of the program and the St. Louis Safety Council, Missouri Manufacturers Association and other organizations prominent in local safety and welfare work will be invited to co-operate.

Cement mills expected to participate are as follows:

The Atlas Portland Cement Co., Hannibal, Mo.; Alpha Portland Cement Co., Jefferson Barracks (near St. Louis), Mo.; Marquette Cement Manufacturing Co., Cape Girardeau, Mo., and Missouri Portland Cement Co., St. Louis, Mo.

La Salle, March 4

The regional safety meeting to be held at Hotel Kaskaskia, LaSalle, Ill., on March 4 will be the sixth annual affair of this kind held in the Illinois cement city. The assembly and club rooms of the Illinois Valley Manufacturers Club have again been secured for the morning and afternoon sessions and the main banquet room for the annual safety dinner at 6:30 p. m.

Henry McClarnan, general superintendent of western mills of the Alpha Portland Cement Co., is expected to act as chairman, assisted by a local committee consisting of John Young, superintendent of the Lehigh Portland Cement Co. at Oglesby, Ill., and W. E. Wuerth, works manager of the Medusa Portland Cement Co. at Dixon, Ill. Richard Moyle, Sr., general superintendent of the Marquette Cement Manufacturing Co., and F. H. Sass, employment manager of the Buffington plant of the Universal Portland Cement Co.

C. A. Herbert of the U. S. Bureau of Mines safety staff, as well as the Illinois Valley Manufacturers Club and local physicians and manufacturers, will co-operate to provide a day of profitable study of accident prevention methods. In addition to the LaSalle plants of the Alpha and Marquette companies, Oglesby plant of the Lehigh company and Dixon plant of the Medusa company, and all three mills of the Universal Portland Cement Co. at Buffington, Ind., will be represented.

Des Moines, March 18

Iowa and Minnesota cement mills will hold their annual safety meeting at Hotel Fort Des Moines, Des Moines, on March 18. W. H. Klein, general manager in charge of the southern and western mills of the Pennsylvania-Dixie Cement Corp., will act as general chairman, and R. A. Bechtold, superintendent of the Pennsylvania-Dixie plant at Des Moines, as vice-chairman. All of the Iowa plant superintendents will be called upon to assist in perfecting an unusual program.

An effort will be made to organize a first aid contest of all of the Iowa mills under the direction of W. D. Ryan of Kansas City, safety commissioner of the U. S. Bureau of Mines, who will be present representing the work of the Bureau. Practically all of the Iowa mills now have well trained first-aid teams.

Cement plants expected to participate in the meeting are as follows:

Dewey Portland Cement Co., Davenport,

Ia.; Hawkeye Portland Cement Co., Des Moines, Ia.; Lehigh Portland Cement Co., Mason City, Ia.; Northwestern States Portland Cement Co., Mason City and Gilmore, Ia.; Pennsylvania-Dixie Cement Corp., Des Moines, Ia., and Universal Portland Cement Co., Duluth, Minn.

Kansas City, March 25

The Kansas City regional safety meeting is to take place as a part of the Central States Safety Congress to be held in the Muehlbach and Baltimore hotels during the week starting March 24. The cement meetings are to be assigned space in the Muehlbach on Tuesday, March 25. The Central States Congress, conducted under the direction of F. C. Lynch, manager of the Kansas City Safety Council, will be one of the largest safety meetings of the entire year.

R. M. Johnson, district superintendent of the Consolidated Cement Corp., with headquarters at Mildred, Kan., will be general chairman of the cement meetings. There will be a morning session at 10 o'clock and an afternoon session at 2 o'clock with a special "cement" luncheon at 12:30 noon. The cement mill representatives will join with those of other industries in a great safety banquet on the evening of March 25, with speakers of national prominence. Safety Commissioner W. D. Ryan of the Bureau of Mines will be present and will assist in the portion of the program devoted to first aid demonstration and discussion.

The following cement mills are expected to join in the Central States Congress and regional cement safety meeting:

Ash Grove Lime and Portland Cement Co., Chanute, Kan., and Louisville, Neb.; the Atlas Portland Cement Co., Independence, Kan.; Consolidated Cement Corp., Fredonia, Kan., and Mildred, Kan.; Dewey Portland Cement Co., Dewey, Okla.; Lehigh Portland Cement Co., Iola, Kan.; Lone Star Cement Co. (Kansas), Bonner Springs, Kan.; Missouri Portland Cement Co., Independence, Mo., and Monarch Cement Co., Humboldt, Kan.

Albany, April 15

Albany will have its fourth annual safety meeting April 15, attended by representatives of the mills of Eastern New York, New England and Quebec. As usual the meeting will be held at Hotel Ten Eyck, scene of the three previous successful meetings of this group.

F. P. Monaghan, superintendent of the Glens Falls Portland Cement Co., will act as general chairman. R. D. Currie, in charge of the safety work of the U. S. Bureau of Mines in that area, will be present and cooperating in the first aid features. E. D. Parry, chairman of the cement section of the National Safety Council, will attend and will describe the great program of new activities being undertaken by the cement section. Representatives of New York State department of labor and industry and the state insurance fund, as well as a number of industrial safety leaders of that section, will be present to assist with the program.

Cement mills which will participate are as follows:

Alpha Portland Cement Co., Cementon, N. Y., and Jamesville, N. Y.; the Atlas Portland Cement Co., Hudson, N. Y.; Canada Cement Co., Ltd., Montreal, P. Q., and Hull, P. Q.; Glens Falls Portland Cement Co., Glens Falls, N. Y.; Lawrence Portland Cement Co., Thomaston, Me.; Lehigh Portland Cement Co., Alsen, N. Y.; Lone Star Cement Co. (New York), Hudson, N. Y.; National Cement Co., Montreal, P. Q.; North American Cement Corp., Catskill, N. Y., and Howe's Cave N. Y., and Pennsylvania-Dixie Cement Corp., Portland Point, N. Y.

Easton, May 29

Lehigh Valley cement mills are already looking ahead to the mammoth safety rally to be held at Hotel Easton on May 29. This meeting will be held during the week of the spring meeting of the Portland Cement Association at New York and preparations are being made for the entertainment of many visitors. Among 50 or more delegates of mills throughout America which operated in 1929 without accident, will be present to occupy the front rows.

There will be an afternoon session only at this meeting, with a great safety banquet and rally in the evening. The meeting will open at 1:30 p. m., and is expected to continue until 5:30 p. m. S. Henry Harrison, assistant superintendent of the Vulcanite Portland Cement Co., Vulcanite, N. J., is to be general chairman. Mr. Harrison will be assisted by several active committees, the Lehigh Valley Safety Council, C. W. Jeffers of the U. S. Bureau of Mines, E. D. Parry, chairman of the cement section of the National Safety Council; Harry D. Immel, director, bureau of inspection, and Thomas J. Quigley, director, quarry section, Pennsylvania state department of labor and industry, and a number of others.

The mills joining in this meeting are:

Allentown Portland Cement Co., Evansville, Penn.; Alpha Portland Cement Co., two mills at Martin's Creek, Penn.; the Atlas Portland Cement Co., three mills at Northampton, Penn.; Giant Portland Cement Co., two mills at Egypt, Penn; Hercules Cement Corp., Stockerstown, Penn.; Lawrence Portland Cement Co., Siegfried, Penn.; Lehigh Portland Cement Co., Bath, Penn., Foglesville, Penn., Ormrod, Penn. (three mills), Sandt's Eddy, Penn., and West Coplay, Penn.; Nazareth Cement Co., Nazareth Penn.; Pennsylvania-Dixie Cement Corp., Nazareth, Penn. (two mills), and Bath, Penn.; Lone Star Cement Co. (Pennsylvania), Nazareth, Penn.; Valley Forge Portland Cement Co., West Conshohocken, Penn., and Vulcanite Portland Cement Co., Vulcanite, N. J.

Cleveland, June 24

An extraordinary regional meeting for the cement mills of northern Ohio, western New York and western Pennsylvania will be held at the Hotel Cleveland on June 24. A morning session will start at 10 o'clock and an afternoon session at 2 o'clock, with a "safety dinner" at 6:30.

W. L. White, Jr., general superintendent of the Medusa Portland Cement Co., will act as chairman and will be assisted by W. M. Powell, safety director of the Medusa company, and an active committee. Carl L. Smith, director of the Cleveland Safety Council, will also assist actively. The U. S. Bureau of Mines has already assigned K. L. Marshall, safety engineer, to help organize a first aid contest and assist otherwise. It is expected that Jack Dempster, editor of the cement section news letter, and E. D. Parry, chairman of the cement section, National Safety Council, will appear in a program of unusual safety papers.

The participating mills are as follows:

Bessemer Limestone and Cement Co., Bessemer, Penn.; Canada Cement Co., Ltd., Port Colbourne, Ont.; Crescent Portland Cement Co., Wampum, Penn.; Diamond Portland Cement Co., Middle Branch, Ohio; Federal Portland Cement Co., Buffalo, N. Y.; Great Lakes Portland Cement Corp., Buffalo, N. Y.; Lehigh Portland Cement Co., New Castle, Penn.; Pittsburgh Plate Glass Co., Zanesville, Ohio; Medusa Portland Cement Co., Bay Ridge, Ohio, and Toledo, Ohio; Standard Portland Cement Co., Painesville, Ohio; Universal Portland Cement Co., Universal, Penn., and West Penn Cement Co., Butler, Penn.

Washington, D. C., June 26

The third annual safety meeting of the mills of the Chesapeake region will be held in Washington, D. C., at Hotel Raleigh on June 26.

John J. Porter, vice-president and general manager of the North American Cement Corp., will act as general chairman and A. R. Couchman, safety director of the North American Cement Corp. (Martinsburg, W. Va.), as vice-chairman. Invitations are being extended to leading officials of the U. S. Department of Labor, U. S. Bureau of Mines and American Red Cross to participate. An effort is being made to organize a lively first aid contest.

The following mills are joining in this meeting:

Lehigh Portland Cement Co., Fordwick, Va., and Union Bridge, Md.; Lone Star Cement Co. (Virginia), Norfolk, Va.; Medusa Portland Cement Co., York, Penn. (two mills), and North American Cement Corp., Hagerstown, Md., and Martinsburg, W. Va.

Detroit, July 1

Michigan and Wisconsin mills will hold their regional safety meeting again this year at the Book-Cadillac Hotel, Detroit, July

1. L. C. Hutchins, chief chemist of the Wolverine Portland Cement Co. of Coldwater, Mich., has been selected to act as chairman.

Co-operation is being extended by Eugene J. Brock, chairman of the State Department of Labor and Industry, Lansing; Elmer L. Hewitt, manager of the Detroit Industrial Safety Council; M. J. Ankemy, engineer of the U. S. Bureau of Mines, and a number of the industries of Detroit and vicinity.

Participating mills are as follows:

Alpha Portland Cement Co., Bellevue, Mich.; Consolidated Cement Corp., Cement City, Mich.; Huron Portland Cement Co., Alpena, Mich., and Detroit, Mich.; Manitowoc Portland Cement Co., Manitowoc, Wis.; Newaygo Portland Cement Co., Newaygo, Mich.; Peerless-Egyptian Cement Corp., Detroit, Mich., and Port Huron, Mich.; Petoskey Portland Cement Co., Petoskey, Mich.; Wabash Portland Cement Co., Stroh, Ind.; Wolverine Portland Cement Co., Coldwater, Mich., and Quincy, Mich., and Wyandotte Portland Cement Co., Detroit, Mich.

Seattle, September 9

Cement mills and quarries of the Pacific Northwest will meet at the New Washington hotel, Seattle, September 9. The success of the 1929 meeting at Portland has created a great deal of advance interest in the meeting next September at Seattle. Chester N. Reitze, vice-president and general manager of Superior Portland Cement, Inc., of Seattle, has accepted the chairmanship. Mr. Reitze has been an enthusiastic member of the committee on accident prevention and insurance of the Portland Cement Association for a number of years.

The U. S. Bureau of Mines will be represented by S. H. Ash. Practically all of the mills in this area have enthusiastic first aid teams and an effort is being made to organize an effective contest. A trophy has already been donated for the winning team.

The following mills are expected to participate:

Beaver Portland Cement Co., Gold Hill, Ore.; British Columbia Cement Co., Bamberton, B. C.; International Portland Cement Co., Spokane, Wash.; Lehigh Portland Cement Co., Metalline Falls, Wash.; Northwestern Portland Cement Co., Grotto, Wash.; Olympic Portland Cement Co., Bellingham, Wash.; Oregon Portland Cement Co., Lime and Oswego, Ore.; Pacific Coast Cement Co., Seattle, Wash., and Superior Portland Cement, Inc., Concrete, Wash.

San Francisco, September 16

The third annual safety conference of the California cement mills and quarries will be held at the Hotel St. Francis, San Francisco, on September 16. By common consent, alternate meetings of the California mills have been held in San Francisco and Los Angeles, the 1929 conference having been in the latter city.

J. H. Colton, vice-president in charge of operations of the Pacific Portland Cement Co. of San Francisco, has been appointed chairman and will be assisted by local committees. Mr. Colton's long interest in safety work is well known. S. H. Ash of the U. S. Bureau of Mines, has been assigned to cooperate.

The California mills have become noted for the excellence of their first aid work and a large and hard-fought battle may be expected when the crack teams of the Golden State meet in competition for the California trophy on the afternoon of September 16. Will G. French, director of the State Department of Labor and Industry, and a distinguished group from the California Society of Safety Engineres will be present.

The mills which will participate are as follows:

Calaveras Cement Co., San Andreas, Calif.; Cowell Portland Cement Co., Cowell, Calif.; Monolith Portland Cement Co., Monolith, Calif.; Pacific Portland Cement Co., Redwood City, Calif., and San Juan Bautista, Calif.; Riverside Cement Co., Crestmore (Riverside), Calif., and Oro Grande, Calif.; Santa Cruz Portland Cement Co., Davenport, Calif.; Southwestern Portland Cement Co., Victorville, Calif., and Yosemite Portland Cement Corp., Merced, Calif., and Emory, Calif.

Ogden, September 23

The cement plants of Utah and Idaho which held their first regional safety meeting at Ogden on September 30, 1929, have decided to meet at Hotel Bigelow, Ogden, again on September 23, 1930.

Robert R. Dorland, superintendent of the Union Portland Cement Co. at Devil's Slide, Utah, has been appointed chairman. D. J. Parker, safety engineer of the U. S. Bureau of Mines at Salt Lake City, will be in charge of first aid features and the Utah State Industrial Commission will assist.

Mills to be represented are as follows:

Idaho Portland Cement Co., Inkom, Ida.; Portland Cement Company of Utah, Salt Lake City, Utah; Union Portland Cement Co., Devil's Slide, Utah, and Utah-Idaho Cement Co., Brighton City, Utah.

'Bound to Win' Spirit at Norfolk Plant

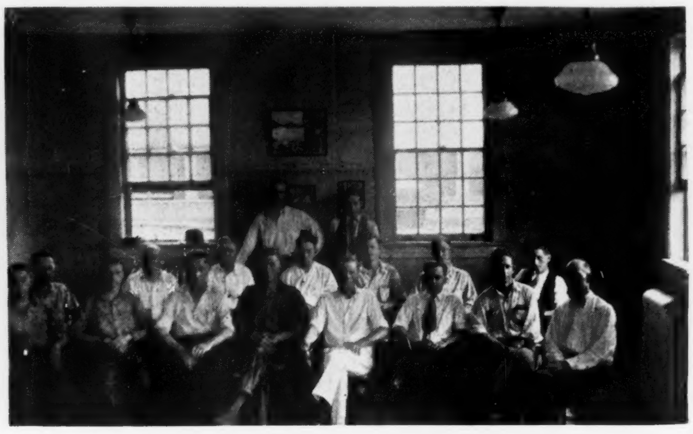
Lone Star of Virginia Organization Excellent Safety Contestants

DOWN at Norfolk, Va., just across the river from Uncle Sam's famous navy yard, the mill organization of the Lone Star Cement Co., Virginia, is putting up a battle against accidents with few equals in the history of cement plant safety activities.

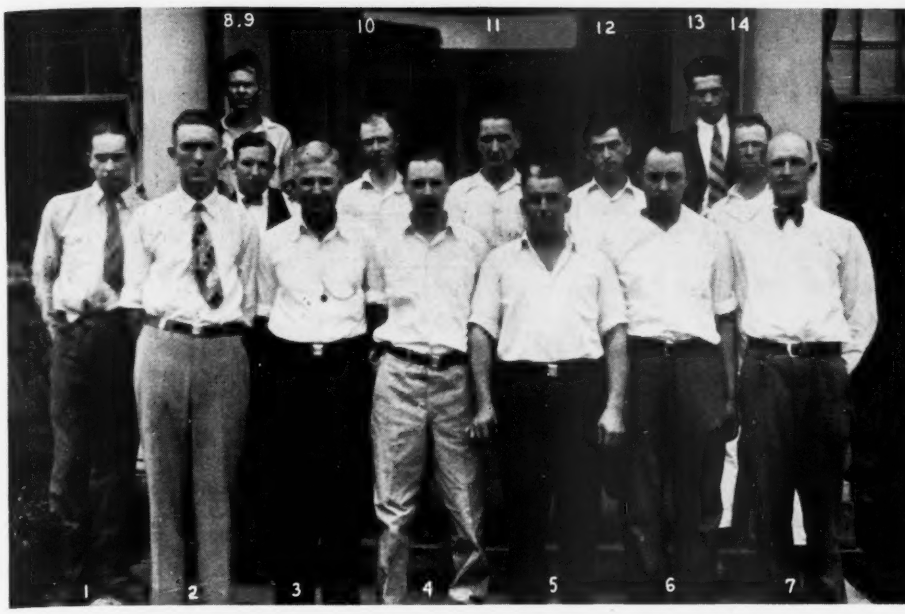
In 1927 the Norfolk plant lost the Portland Cement Association trophy by the margin of a single slight accident. Many months of vigilance and hard work were behind the battle, and the safety committee and workmen determined that although the grand prize had been lost, the experience of the past should not be allowed to go for nothing nor efforts relaxed.

During 1928 the mill made a magnificent showing and at the end of the year Vice-President Dwight Morgan and Superintendent George F. Martinez were able to certify to a record absolutely free from lost-time accidents. Early in the present year, however, a workman who had gotten a large

Plant organization, Lone Star Cement Co., Virginia, Norfolk



First-aid class conducted by A. J. Stromquist



Employes who received first-aid training at Norfolk mill. (See text for identification)

drop of slurry in his eye while looking up an elevator shaft, found trouble developing and it was soon determined that the accident, although involving no loss of time, would result in a slight permanent disability through a small impairment of vision. As the accident took place in 1928 the mill was thus ineligible for the Portland Cement Association trophy for that year, losing for the second time by a painfully narrow margin.

The members of the mill safety organization were at their wits' ends. Some of the workmen lost faith in the possibilities of attaining a perfect record. Others were doggedly persistent. The wiser ones, although regretting the loss of the trophy, were amazed, nevertheless, with the wonderful improvement in their record as a result of the 1927 and 1928 campaigns. Sooner or later practically all of the workmen came to the conclusion that they emerged from the 1928 campaign stronger than ever, and no time was lost in organizing an active drive for a perfect safety record in 1929.

In April President H. Struckmann visited the mill and in a serious talk to the members of the safety committee pointed out the great premium which the world pays for leadership and indicated his entire confidence in the ability of the mill to win in 1929. Since that time interest in the safety campaign has grown month by month. General Superintendent William Moeller, who has been a member of the Portland Cement Association's Committee on Accident Prevention for several years, has taken a lively interest and has made a detailed study of the mill and its personnel from every angle.

First aid training was taken up enthusiastically. A. J. Stromquist, safety engineer of the U. S. Bureau of Mines, visited the mill and organized a class of 14 picked men. An invitation was extended to nearby industries to participate and a few did so. At the end of the training period, Mr. Stromquist was able to leave at the mill as well as at the Chuckatuck quarries a nucleus of men well enough informed to instruct others.

The men who received first aid training and who will act as instructors in training other employes at the mill and quarry are shown in the accompanying illustration. Referring to the numbers, they are:

1. E. C. Georgie, assistant chemist.
2. O. O. Curling, mill shift foreman.
3. W. W. Dail, assistant to master mechanic.
4. R. Stevens, raw mill department.
5. F. A. Gibney, electrician.
6. H. L. Rawls, finish miller.
7. G. R. Hathaway, physical tester (laboratory).
8. W. E. Sawyer, machinist.
9. W. H. Gallup, shipping clerk.
10. A. B. Ward, machinist.
11. L. Ross, coal miller.
12. O. H. Enax, chief electrician.

Chuckatuck, Va.

13. J. M. Christie, Chuckatuck quarry.
14. H. P. Langston, driller, powder man.

Safety meetings have been frequent and plant inspections searching and complete. Plant "housekeeping" has been given most careful attention and the smallest scratches, cuts or abrasions given immediate attention to forestall possible infection. The International Cement Corp.'s bonus plan and safety loving cup award have contributed much to keep up interest and as a result Norfolk plant has succeeded so far during 1929 in avoiding not only lost time and permanent disability accidents, but also everything in the way of a non-lost time accident which might show serious results later.

The "game" safety efforts of the Lone Star Virginia mill have been the subject of more speculation than those of almost any other mill and during the final month of the year interest has become intense.

Bay Bridge Veterans

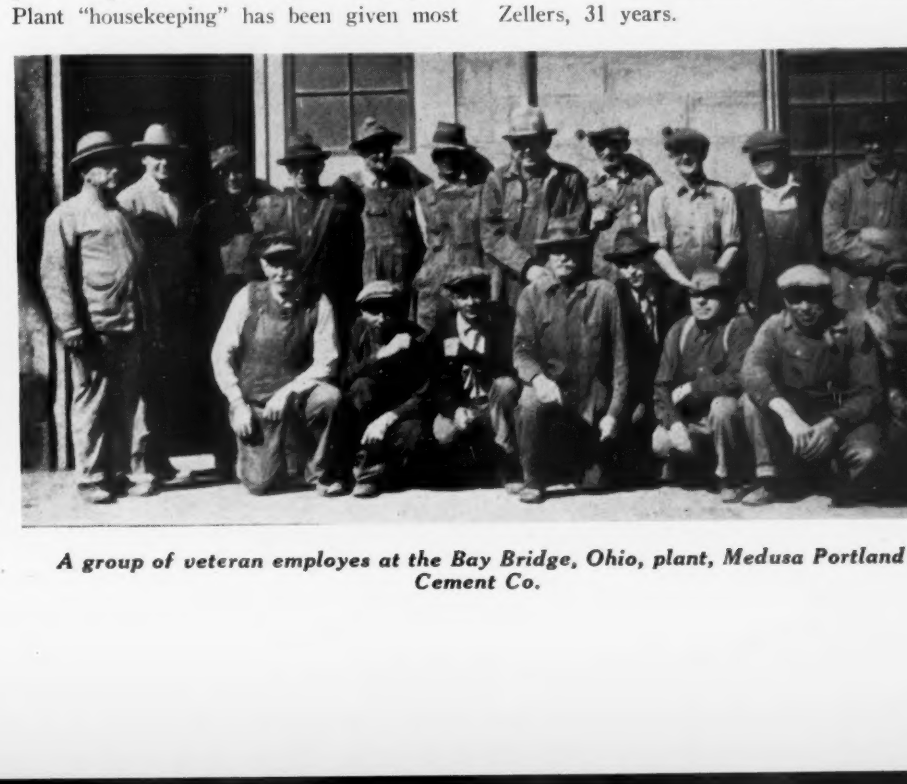
THE accompanying illustration shows an interesting group of the veteran workers of the Bay Bridge (Ohio) plant of the Medusa Portland Cement Co. The combined service of the 20 members of the Bay Bridge Veteran Association totals 545 years, an average of about 26 years per man, believed to be one of the longest averages for any cement plant in the country.

Obviously, the Bay Bridge veterans are safety boosters in precept and practice, which accounts for their long service without serious personal mishaps. Those shown in the illustration with their length of service are as follows:

Front row, left to right: M. Krafty, 23 years; C. Grahl, 21 years; S. Krafty, 20 years; H. Miller, 33 years; I. Nuber, 24 years; H. Trautlein, 31 years; P. Grahl, 27 years; A. Wobser, 27 years.

Back row, left to right: C. Fuchs, 23 years; A. Little, 17 years; A. Manskey, 22 years; F. Krebs, 32 years; M. Martin, 32 years; F. Brunner, 26 years; H. Thiel, 24 years; J. Mulaney, 32 years; J. Myers, 24 years; W. Fredericks, 30 years; N. Young, 25 years.

Two other members not shown in the picture are A. Wintersteller, 21 years, and J. Zellers, 31 years.



A group of veteran employes at the Bay Bridge, Ohio, plant, Medusa Portland Cement Co.

Opalite Produced in N. W. Arkansas*

Corona Silica, Inc., Opens Mine and Builds Plant to Prepare and Distribute Amorphous Silica

OPALITE, an amorphous silica, is being produced on an extensive scale in Arkansas, near Rogers, by Corona Silica, Inc. Opening of the mine, the building of four miles of hard surfaced road over which trucks haul material to the mill at Rogers and the special type of machinery installed have attracted attention in mining circles.

The company has approximately 2,500,000 tons blocked out by test holes on a tract of 157 acres. The Southwestern Engineering Corp., Los Angeles, surveyed and checked the deposit, and it is stated that 10,000,000 tons is a conservative estimate of the available tonnage, which is not completely blocked out. The deposit runs from 10 to 85 ft. in thickness and the material as it comes from the mine is described as about 99% pure.

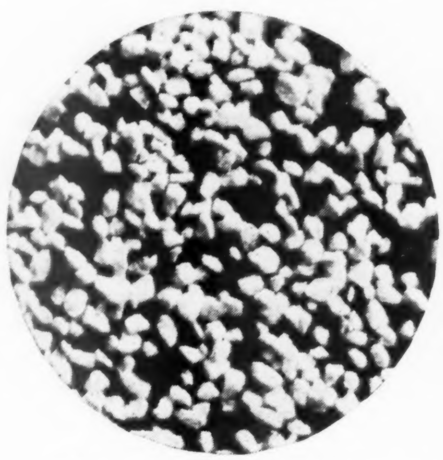
Product Is Mined

The material is mined; if it were removed by power shovels, the lime and oxides would be washed by the rains from the clays above, contaminating the material and increasing the milling and treating cost. The present mining operation is one shaft with a 250-ton hopper. Drifts are 15 ft. high and 15 ft. wide. Pillars, which are zigzagged, are left to support the roof, providing favorable conditions for mining. There is no water in the deposit. Two drifts are being cut from two sides of the shaft through the hill for ventilation. Owing to the peculiar characteristics of the material water must be kept at the point of the drill to prevent the jellification that takes place when the material is drilled in its natural state.

The mill is located on the main line of the Frisco railroad. Crude material is moved from the mine to the mill by truck, each truck carrying about 5½ tons; one truck can transport 50 tons in a 10-hour shift. This form of transportation is stated to have proven economical and satisfactory to the company. The plant is electrically operated throughout with an individual drive for each unit. Material is crushed and conveyed to a pebble mill where it is wetted, ground and treated during the grinding process. The ground material is dried in a Louisville steam drier and then passed to Hum-mer vibrating screens and Gayco air separators which make the different mesh products. Opalite is shipped in 50, 80 and 200 lb. bags and is said to be 99.70% silica.

Silica, as taken from the bed, is of chalk-like consistency, easily broken or cut, but the composition of the minute particles is so hard that ordinary methods of crushing and reducing the mass are practically ineffective, it is said.

The product is being used in the manufacture of hard rubber, enamel, paints, electrical insulators and even cosmetics. Experiments are being conducted in the making of silica brick. Coarser silica is used in the manufacture of composition roofing, creating an outlet for the product of lesser value and not so pure as that which is required for other purposes. More than $150,000 has been expended on the new project, which is headed by R. C. Jones of Cushing, Okla. O. F. Mayfield, formerly of Tonkawa, Okla., is secretary-treasurer of the organization; H. R. McKnight, first vice-president, and W. G. Bisbee, second vice-president. R. A. Airheart is sales manager. The corporation is a closed one, incorporated under the laws of Delaware for $750,000 and raised recently to $1,000,000.



A 300-mesh particle of silica, magnified 200 times

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A Rock Products Basis of Prehistoric Culture

AN interesting cable is to hand from Vienna which states that some time ago a prehistoric flint mine was discovered in the Wienerwald Hills, near the village of Mauer, southwest of Vienna. The mine consists of a sort of hornstone, and geologists say that it is unique in Europe.

Professor Bayer, the director of the Museum of Natural History, now states that he has discovered relics of a town connected with the mine, dating back to the stone age. The neolithic people who worked the mine had a highly developed technical culture, making tools and many other domestic articles out of flint. They made excellent use of the mine which was obviously worked by them for several centuries. A flourishing export trade was built up, and Mauer became a center of prehistoric culture. Professor Bayer declares that the skeletons found may be about 5000 years old.

Emeralite Company Buys Into Scarlet Stone Co.

THE Emeralite Surfacing Products Co., Ely, Minn., has purchased a half interest in the plant of the Scarlet Stone Co. at Pipestone, Minn.

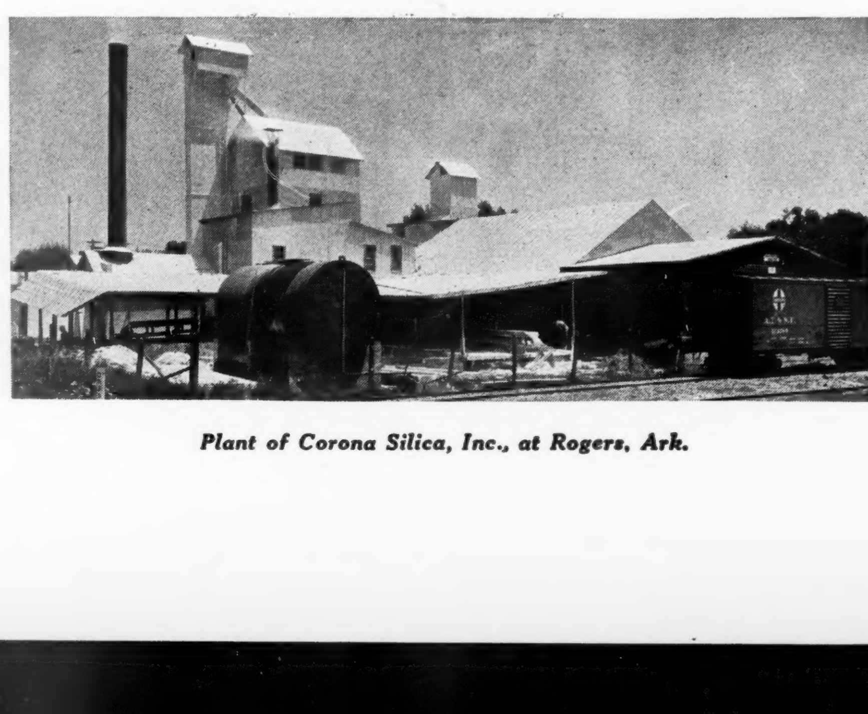
The new company will take control of the interest in the company formerly controlled by M. Becker of Chicago, the Jelier family of Pipestone having control of the other half of the business.

The stone crushing plant will be operated in the future in conjunction with the Emeralite company's plant in Ely. In order to speed up production the Pipestone plant soon will be in operation night and day.—*Sioux City* (Iowa) *Journal.*

Certain-Teed Plans Large Advertising Campaign

A NATIONWIDE home modernization and improvement plan, designed to promote and advance the sales of the 150 building items manufactured by them, will be started shortly by the Certain-Teed Products Corp. Popular deferred payments, similar to those offered by the radio, automobile, etc., concerns, are a feature.

The Certain-Teed company manufactures gypsum plasters and wallboard in addition to many other materials.



Plant of Corona Silica, Inc., at Rogers, Ark.

Phoenix Company to Build Gravel Plant at Bagnell, Mo.

PHOENIX SAND AND GRAVEL CO., Bagnell, Mo., is reported to have acquired an island in Osage river, which it will develop for its sand and gravel. A new plant will be built and plans include installation of power equipment, elevating, conveying and other machinery.

The new operation, which will handle about 100 cars daily, will be erected west of Little Gravois Creek. Two 600-hp. electric units driven by Fairbanks-Morse Diesel engines will supply power for operations. Other buildings include an office, two bunkhouses, mess hall and five cottages. From 50 to 100 men will be employed.

Georgia's Beryl Deposits May Be Developed

THE GROWING demand for beryllium may cause the development of Georgia deposits containing this metal, according to a report in the *Cartersville* (Ga.) *News*. The mineral is met with in North Georgia, where it occurs in pegmatite dikes associated with mica, feldspar and quartz. There are also some deposits in Troup, Elbert, Cherokee, Spalding and Raburn; the extent of these is not known but it is believed that there is sufficient to warrant commercial surveys.

Beryllium is the hardest and most inert of the light metals and for these qualities is desired greatly for precision instruments, motors and aircraft uses. In 1922 it sold for $5000 per lb. but improved production methods indicate that it is feasible to produce the metal at a price and scale commercially attractive.

Williston Shell Rock Firms Operating at Capacity

CRUSHED rock plants in and about Williston, Fla., are reported busy filling orders which are expected to carry the operations into capacity production for some time. It is estimated that orders for 5000 cars of material are on hand, principally from the letting of the Keystone Heights and Orange Heights contracts.—*Williston* (Fla.) *Sun*.

National Portland Completing Plans for Vicksburg Mill

THE National Portland Cement Co. is going forward with plans for the construction of a new plant at Vicksburg, Miss., and expects to begin work and place orders for machinery sometime in January. Quarries, fronting 1750 ft., have been acquired on the Mississippi river, near Vicksburg, according to report.

As stated in ROCK PRODUCTS, October 17, 1929, the National Portland Cement Co. has been incorporated under the laws of Mississippi with capital of $50,000 and the following officers named: H. J. Harris, Dallas, Texas, president; Joe Finger, Houston, Texas, vice-president; C. T. Atkinson, Dallas, Texas, secretary-treasurer, and C. W. Boone, Tyler, Texas, chairman of executive committee. A. J. Kutner, Santa Fe Bldg., Dallas, is assistant general manager.

Wisconsin to Adopt New Safety Code for Quarries and Pits

WISCONSIN quarries and gravel pits where explosives are used to dislodge great quantities of material will soon operate under a new quarry and explosives safety code of the industrial commission.

New orders, soon to be approved by the commission following public hearings at which the old code was clarified and improved, hold that all workers around the scene of blasting be herded under bombproof shelter before each shot.

Most of the industrial accidents in these lines of work occur in cave-ins of gravel or slides of overlay and stone or gravel in quarries. They have inserted provisions that all grades of gravel pits slope back at 60 deg. incline, which has been found enough to prevent heavy slides.

Overhang, or top surfacing that thaws and falls in the spring or is washed down by rains upon unsuspecting workers, must now be peeled back at the top of any excavation, at least to the number of feet the overhang is deep.

The new orders command use of red flags on highways near the scene of any blasting. They regulate the length of fuses, length of time workers must wait for sputtering fuses to go out, and hold that 500 ft. is the limit at which everyone must stay from explosives about to be fired.—*Madison* (Wis.) *Journal*.

Canada Cement to Convert Montreal Plant from Dry to Wet

THE Canada Cement Co., Ltd., Montreal, Que., has decided to convert its No. 1 plant at Montreal from dry to wet process. Contracts have been let to F. L. Smidth and Co., New York City. Included in the new equipment will be four "Unax" rotary kilns—probably the largest yet installed in America; five new four-compartment grinding machines known as "Uni-korn" mills, each direct-connected through "Symetro" drives to 900-hp. motors. F. L. Smidth and Co. agitators and a "skipulter" conveyor are included. The plans call for complete new burning and raw grinding departments. On the finish end the company will continue to use its present equipment, which includes Smidth "Kominuters" and tube mills.

Northwestern Portland to Enter Sand and Gravel Trade

THE Northwestern Portland Cement Co., operating a cement plant at Grotto, Wash., has just purchased a plant site on Maury Island for the purpose of entering on a large scale, the sand and gravel business.

Plans for a modern plant are being prepared by both the Link-Belt Co. engineers and another firm for mechanical equipment, bunkers, etc., and construction work will be started in the near future. Maury Island is in Puget Sound, 20 miles south of Seattle and 10 miles north of Tacoma. It is estimated that the gravel reserves on the island are sufficient for many years' operation.

The plant, when completed, will have a capacity of better than 100 cu. yd. per hour.

Both sales and management of the new department of the company will be handled by the present staff of the Northwestern Portland Cement Co., from its general offices in the Dexter-Horton Building. G. Macdonald is president of the Northwestern company.—*Portland* (Ore.) *Journal of Commerce*.

Memphis to Have New Cast Stone Plant

ESTABLISHMENT of a new $50,000 manufacturing plant in Memphis is assured, according to Henry S. Blumenthal, organizer of Duntile-Duntex Corp., of Memphis, which expects to have a factory operating here soon after January 1. The company makes artificial building stone and a roofing material.

The Memphis factory will be the first of 20 such plants in the South and Southwest, Mr. Blumenthal said. It is expected, however, that other units will be operated under separate charters. The Memphis company filed application for its charter recently.

Incorporators, in addition to Mr. Blumenthal, are Claude J. Tully, L. C. Schaffler, W. B. Herbert and Max Polanzky. Capital stock is listed at $50,000, with 500 shares of common.

Four or five sites are under consideration for the plant location, Mr. Blumenthal said, and construction will start at an early date. —*Memphis* (Tenn.) *News*.

E. A. Henderson

EARL ADAM HENDERSON, traffic manager of Oliver King Sand and Lime Co., and an employe of that company for 27 years, died recently in Knoxville, Tenn. after an illness of two months. He was 42.

Mr. Henderson was born in Knoxville and had worked for the Oliver King company since finishing school. He later became a bookkeeper and finally traffic manager, a position he filled until his health failed.

Eastern Cement Prices Are Advanced

NEWSPAPERS throughout the east have carried a news item under date of November 26 announcing a general increase in the prices of portland cement. The following from the *New York World* is the most complete we have seen:

"Portland cement producing companies yesterday made a general increase in the price of that commodity in the northeastern and southeastern territory. The advance brings prices practically back to the levels prevailing in August. Competitive price-cutting since then has reduced the selling price to figures at which producers claimed they could make no profit.

"The advances ranged from 10 cents to 50 cents a barrel. The Lehigh Portland Cement Co. advanced the price of portland cement 30 cents a barrel in the Lehigh valley and Hudson river districts, 20 cents a barrel in New York City and 10 to 50 cents a barrel in the southeastern district.

"Pennsylvania-Dixie Cement Corp. advanced the price of portland cement 20 cents a barrel in New York City, 30 cents in New England and 30 cents in New York state and the Lehigh valley territory.

"Commenting on the action of other companies, a spokesman for International Cement Corp. said its field men had reported rises of 20 to 30 cents a barrel in the northeastern territory and 50 cents a barrel in the southeastern territory. It was said that the International Cement Corp. probably would make the same advances as soon as the reports were confirmed."

Lake Ports Supply Corporation Organized

THE DOLOMITE Materials Co., Detroit, Mich., dealer organization for Dolomite, Inc., crushed stone producers at Maple Grove, Ohio, and the Leathem D. Smith properties at Sturgeon Bay, as well as other associated companies, dealers in crushed stone, sand and gravel, cement, etc., has changed its corporation name to Lake Ports Supply Corp. The general office for the Michigan district will be located, as formerly, at 1917 Penobscot building, Detroit.

National Lime and Stone Co. to Ship Into Bluffton

NEGOTIATIONS are under way between the National Lime and Stone Co. and the Western Ohio traction line to establish a freight rate low enough to enable the stone company to ship its product into Bluffton, Ohio, on a competitive basis from its Findlay plant.

The National company's plant at Bluffton was burned recently and the company decided not to rebuild it, preferring to ship into that territory from its Bluffton plant. Attempts were made by the town council of Bluffton to have the National company reconsider its decision not to rebuild, but judging from the above, the company will stick to its original plans. Holdings of about 44 acres within the limits of Bluffton are to be retained in order to be in a position to rebuild if future conditions justify.

Should a satisfactory agreement be reached with the traction company on the matter of rates, unloading facilities will be placed at Bluffton and distribution of stone continued to supply the local demand as has been formerly done.—*Bluffton* (Ohio) *News.*

Rock Phosphate and Limestone Have Biggest Year

IT IS already evident that 1929 will break all records in the use of agricultural limestone and ground rock phosphate by Illinois farmers, according to J. R. Bent, director of the limestone-phosphate department of the Illinois Agricultural Association.

Mr. Bent has just returned from a tour of quarries throughout the middle west. He reports that activity among quarry operators in supplying the needs of Illinois farmers in building a permanent soil fertility was never greater than during recent months.

"It seems probable in the case of agricultural limestone that 1929 will be the largest year any state has ever had—breaking Illinois own record of 1925," said Mr. Bent.

"In the case of ground rock phosphate, it will be one of the two largest years within the last ten.

"These fine results are attributed largely to the fine co-operation existing between the Farm Bureaus, the University of Illinois, the I. A. A. and the producing companies.

"The I. A. A. has contracts with many of the companies which tend for reliable service and satisfactory quality at low cost. It is evident that farmers appreciate this service."—*Onarga* (Ill.) *Review.*

Organize Mississippi Sand and Gravel Association

PRODUCERS of sand and gravel in Mississippi met in Columbus recently and organized the Mississippi Sand and Gravel Association, with T. W. Maddux of Brookhaven as president. Every producer in the state was present for the convention.

Other officers were elected as follows: C. F. Harris, Columbus, vice-president; N. W. Rockett, Hattiesburg, treasurer; H. B. Weston, Logtown, recording secretary; R. L. McChesney, New Orleans, executive secretary, and H. B. Rigby, Jackson; R. M. Walters, Columbus; W. B. Thigpen, Jr., Hattiesburg; W. C. Robbins, Amory, and Lee McCourt, Greenville, directors.

Members of the executive committee will be Messrs. Maddux, Harris, Rockett, Weston, G. B. Denham, Hattiesburg, and R. N. Kinnaird, Jackson.—*Jackson* (Miss.) *News.*

Directors of the Portland Cement Association

AT THE ANUAL MEETING of the Portland Cement Association, which was held in Chicago, November 18-20, Frank H. Smith was re-elected to the presidency, as noted in ROCK PRODUCTS, November 23. Mr. Smith is president of the Lawrence Portland Cement Co.

Other officers elected for the coming year are as follows: First vice-president, Charles L. Hogan (International Cement Corp.); second vice-president, Blaine S. Smith (Pennsylvania-Dixie Cement Corp.); treasurer, C. E. Ulrickson (Trinity Portland Cement Co.). Directors to serve three years: J. B. John (Medusa Portland Cement Co.); D. H. MacFarland (Atlas Portland Cement Co.); Charles Schmutz (Bessemer Cement Corp.); John L. Senior (Consolidated Cement Corp.); and F. E. Tyler (Dewey Portland Cement Co.).

Wm. M. Kinney was re-elected secretary and general manager; G. E. Warren, assistant secretary; and F. L. Page, assistant treasurer.

Oceanside Rock Acquires Another Sand Plant

R. W. BAIRD of the Oceanside Rock and Sand Co. announces the acquisition of another sand plant for the company just north of Oceanside on the San Margarita ranch, says the *Carlsbad* (Calif.) *Journal.*

This makes three sand plants now under control of the company. One of the other plants is on the Wilson property near the San Luis Rey mission and the other is the sand plant on the river.

Quarry Plant to Be Built at Buncombe, Ill.

THE National Quarry and Stone Co. is prepared to install its plant north of Buncombe, Ill., it has just been announced. The company will quarry and ship from a large limestone deposit at that place. Construction of a spur switch of four tracks to its plant to be used jointly by the Chicago and Eastern Illinois railroad and the Chicago, Burlington and Quincy line for the shipping of stone is planned. A concrete block plant will be installed at a later date.

H. G. Wright Joins Staff of Hardinge Company

HOWARD G. WRIGHT, formerly chief engineer of the North American Cement Corp., Catskill, N. Y., has joined the staff of the Hardinge Co. as research engineer in the cement machinery department. Mr. Wright will devote a large part of his time to working up engineering data for the various classes of Hardinge equipment used in cement plants.

Indiana Awards Contracts for 2,000,000 Bbl. of Cement

THE INDIANA State Highway Commission has recently made the following awards in cement contracts for 1930, the 2,000,000 bbl. so contracted for to be supplied by nine cement companies. The successful bidders and the amounts awarded are:

Kosmos Portland Cement Co., Inc., Kosmosdale, Ky., 25,000 bbl.

Lehigh Portland Cement Co., Mitchell, Ind., 225,000 bbl.

Louisville Cement Co., Speed, Ind., 200,000 bbl.

Lone Star Cement Company, Indiana, Inc., Limedale, Ind., 475,000 bbl.

Marquette Cement Manufacturing Co., Chicago, Ill., 500,000 bbl.

Medusa Portland Cement Co., Cleveland, Ohio, 25,000 bbl.

Pittsburgh Plate Glass Co., Pittsburgh, Penn., 25,000 bbl.

Universal Portland Cement Co., Buffington, Ind., 475,000 bbl.

Wabash Portland Cement Co., Stroh, Ind., 50,000 bbl.

The accompanying table shows the various bids made by the different cement companies for cement, delivered at destination indicated. These bids are all net including sacks and subject to a 10 c. per bbl. discount for cash within 15 days and a further 10 c. per bbl. discount because of direct sale (this 10 c. is usually the dealer's differential).

TABULATION OF CEMENT PRICES CONTAINED IN PROPOSALS RECEIVED NOVEMBER 19, 1929, FOR FURNISHING CEMENT TO INDIANA STATE HIGHWAY COMMISSION FOR 1930

Destination	Lehigh (Mitchell)	Lone Star (Limedale)	Louisville (Speeds)	Universal (Buffington)	Wabash (Stroh)	Alpha	Atlas	Consolidated	Hermitage	Kosmos	Marquette	Medusa	Pittsburgh Plate Glass	Southwestern (Osborne, O.)	Wolverine
Albion	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	......	......	2.40	2.40	2.40	2.40	2.40
Anderson	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.29	2.34	2.34	2.34	2.34
Angola	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	2.44	......	2.44	2.44	2.44	2.44	2.44
Auburn	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	......	......	2.42	2.42	2.42	2.42	2.42
Bedford	2.32	2.32	2.32	2.32	2.32	......	2.32	......	2.32	2.32	2.32	......	2.32	......	......
Bloomfield	2.32	2.32	2.32	2.32	2.32	......	2.32	......	2.32	2.32	2.32	......	2.32	......	......
Bloomington	2.30	2.30	2.30	2.30	2.30	......	2.30	......	2.30	......	2.30	......	2.30	......	......
Bluffton	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.37	2.42	2.42	......	2.42
Boonville	2.30	2.30	2.30	2.30	2.30	......	2.30	......	2.30	2.30	2.30	......	2.30	......	......
Brazil	2.27	2.27	2.27	2.27	2.27	......	2.27	......	......	......	2.27	......	2.27	......	......
Brookville	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	......
Cannelton	2.34	2.34	2.34	2.34	2.34	......	2.34	......	2.34	2.34	2.34	......	2.34	......	......
Columbia City	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	......	2.30	2.40	2.40	2.40	2.40
Columbus	2.34	2.34	2.34	2.34	2.34	2.34	2.34	......	2.34	2.34	2.34	......	2.34	2.34	......
Connersville	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	......
Corydon	2.46	2.46	2.46	2.46	......	2.46	2.46	......	2.46	2.46	2.46	......	2.46	......	......
Covington	2.32	2.32	2.32	2.32	2.32	......	2.32	2.32	2.32	......	2.32	......	2.32	......	......
Crawfordsville	2.29	2.29	2.29	2.29	2.29	......	2.29	2.29	......	......	2.29	......	2.29	......	......
Crown Point	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	......	......	2.17	......	2.27	......	......
Danville	2.29	2.29	2.29	2.29	2.29	......	2.29	2.29	2.29	......	2.29	......	2.29	......	......
Decatur	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.43	2.38	2.43	2.43	2.43	2.43
Delphi	2.34	2.34	2.34	2.34	2.34	......	2.34	2.34	......	......	2.29	2.34	2.34	......	......
English	2.36	2.36	2.36	2.36	......	2.36	2.36	......	2.36	2.36	2.36	......	2.36	......	......
Evansville	2.30	2.30	2.30	2.30	2.30	......	2.30	......	2.30	2.30	2.30	......	2.30	......	......
Fort Wayne	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.37	2.42	2.42	2.42	2.42
Fowler	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	......	......	2.24	......	2.34	......	......
Frankfort	2.32	2.32	2.32	2.32	2.32	......	2.32	2.32	......	......	2.32	......	2.32	......	......
Franklin	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	......	2.32	2.32	......
Goshen	2.36	2.36	2.36	2.36	2.36	......	2.36	2.36	......	......	2.26	2.36	2.36	......	2.36
Greencastle	2.25	2.25	2.25	2.25	2.25	......	2.25	......	......	......	2.25	......	2.25	......	......
Greenfield	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	......	2.32	......	2.32	2.32	......
Greensburg	2.36	2.36	2.36	2.36	2.36	2.36	2.36	......	2.36	2.36	2.36	......	2.36	2.36	......
Hartford City	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.35	2.40	2.40	2.40	2.40
Helmsburg	2.30	2.30	2.30	2.30	2.30	......	2.30	......	2.30	......	2.30	......	2.30	......	......
Huntington	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.42	2.32	2.42	2.42	2.42	2.42
Indianapolis	2.29	2.29	2.29	2.29	2.29	......	2.29	2.29	2.29	......	2.29	......	2.29	......	......
Jasper	2.36	2.36	2.36	2.36	2.36	2.36	2.36	......	2.36	2.36	2.36	......	2.36	......	......
Jeffersonville	2.32	2.32	2.32	2.32	2.32	2.32	2.32	......	2.32	2.32	2.32	......	2.32	......	......
Kentland	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	......	......	2.22	......	2.32	......	......
Knox	2.30	2.30	2.30	2.30	2.30	......	2.30	2.30	......	......	2.20	......	2.30	......	2.30
Kokomo	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	......	2.34	2.34	2.34	2.34	2.34
Lafayette	2.32	2.32	2.32	2.32	2.32	......	2.32	2.32	......	......	2.27	......	2.32	......	......
Lagrange	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	......	......	2.40	2.40	2.40	2.40	2.40
Laporte	2.29	2.29	2.29	2.29	2.29	......	2.29	2.29	......	......	2.19	......	2.29	......	......
Lawrenceburg	2.36	2.36	2.36	2.36	2.36	2.36	2.36	......	2.36	2.36	2.36	2.36	2.36	2.36	......
Lebanon	2.30	2.30	2.30	2.30	2.30	......	2.30	2.30	......	......	2.30	......	2.30	......	......
Liberty	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	......
Logansport	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	......	2.26	2.36	2.36	2.36	2.36
Madison	2.40	2.40	2.40	2.40	2.40	2.40	2.40	......	2.40	2.40	2.40	2.40	2.40	2.40	......
Marion	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.35	2.40	2.40	2.40	2.40
Martinsville	2.29	2.29	2.29	2.29	2.29	......	2.29	2.29	2.29	......	2.29	......	2.29	......	......
Monticello	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	......	......	2.24	2.34	2.34	......	......
Mt. Vernon	2.32	2.32	2.32	2.32	2.32	2.32	2.32	......	2.32	2.32	2.32	......	2.32	......	......
Muncie	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.31	2.36	2.36	2.36	2.36
New Albany	2.32	2.32	2.32	2.32	2.32	2.32	2.32	......	2.32	2.32	2.32	......	2.32	......	......
Newcastle	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34
Newport	2.32	2.32	2.32	2.32	2.32	......	2.32	2.32	2.32	......	2.32	......	2.32	......	......
Noblesville	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	......	2.32	......	2.32	2.32	2.32
North Vernon	2.38	2.38	2.38	2.38	2.38	2.38	2.38	......	2.38	2.38	2.38	......	2.38	2.38	......
Osgood	2.38	2.38	2.38	2.38	2.38	2.38	2.38	......	2.38	2.38	2.38	2.38	2.38	2.38	......
Paoli	2.36	2.36	2.36	2.36	2.36	2.36	2.36	......	2.36	2.36	2.36	......	2.36	......	......
Peru	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.30	2.40	2.40	2.40	2.40
Petersburg	2.34	2.34	2.34	2.34	2.34	2.34	2.34	......	2.34	2.34	2.34	......	2.34	......	......
Plymouth	2.32	2.32	2.32	2.32	2.32	......	2.32	2.32	......	......	2.27	2.32	2.32	......	2.32
Portland	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41
Princeton	2.32	2.32	2.32	2.32	2.32	2.32	2.32	......	2.32	2.32	2.32	......	2.32	......	......
Rensselaer	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	......	......	2.22	......	2.32	......	......
Richmond	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38	2.38
Rochester	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	......	......	2.26	2.36	2.36	2.36	2.36
Rockport	2.34	2.34	2.34	2.34	2.34	2.34	2.34	......	2.34	2.34	2.24	......	2.34	......	......
Rockville	2.29	2.29	2.29	2.29	2.29	......	2.29	......	2.29	......	2.29	......	2.29	......	......
Rushville	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	......
Salem	2.36	2.36	2.36	2.36	2.36	2.36	2.36	......	2.36	2.36	2.36	......	2.36	......	......
Scottsburg	2.38	2.38	2.38	2.38	2.38	2.38	2.38	......	2.38	2.38	2.38	......	2.38	2.38	......
Seymour	2.36	2.36	2.36	2.36	2.36	2.36	2.36	......	2.36	2.36	2.36	2.36	2.36	2.36	......
Shelbyville	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	2.32	......	2.32	2.32	......
Shoals	2.39	2.39	2.39	2.39	2.39	2.39	2.39	......	2.39	2.39	2.29	......	2.39	......	......
South Bend	2.32	2.32	2.32	2.32	2.32	......	2.32	2.32	......	......	2.27	2.32	2.32	......	2.32
Spencer	2.30	2.30	2.30	2.30	2.30	......	2.30	......	2.30	......	2.30	......	2.30	......	......
Sullivan	2.32	2.32	2.32	2.32	2.32	2.32	2.32	......	2.32	......	2.32	......	2.32	......	......
Terre Haute	2.29	2.29	2.29	2.29	2.29	......	2.29	......	2.29	......	2.29	......	2.29	......	......
Tipton	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	2.34	......	2.34	2.34	2.34	2.34	2.34
Valparaiso	2.27	2.27	2.27	2.27	2.27	......	2.27	2.27	......	......	2.17	......	2.27	......	......
Vincennes	2.34	2.34	2.34	2.34	2.34	2.34	2.34	......	2.34	2.34	2.34	......	2.34	......	......
Wabash	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.40	2.30	2.40	2.40	2.40	2.40
Warsaw	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	......	......	2.31	2.36	2.36	2.36	2.36
Washington	2.34	2.34	2.34	2.34	2.34	2.34	2.34	......	2.34	2.34	2.24	......	2.34	......	......
Williamsport	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	......	2.26	......	2.36	......	......
Winamac	2.36	2.36	2.36	2.36	2.36	2.36	2.36	2.36	......	......	2.31	2.36	2.36	2.36	2.36
Winchester	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39
Mill price*	2.10	2.00	2.25	2.00	2.10	......	......	......	......	......	......	......	......	2.25	......
Total discounts†	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20	.20
Amount of proposal	1,000,000	2,000,000	500,000	2,000,000	500,000	500,000	2,000,000	100,000	200,000	200,000	500,000	300,000	200,000	250,000	100,000

*Less 40c. for sacks.

†10c. for payment within 15 days and 10c. for elimination of usual dealer differential.

Iowa to Ask Bids on 2,000,000 Bbl. of Cement

FOLLOWING the experimental policy inaugurated late this year, the Iowa state highway commission is preparing to purchase about 2,000,000 bbl. of cement direct from the manufacturers for use upon state highway construction projects. Under the usual contract form, the manufacturers agree to deliver the product to the contractors on the job. The direct purchase, it is estimated, will effect a saving of about 10 cents a bbl. (the dealer differential) upon material. The supply will be sufficient for half of the 1000 miles of paved roads program. Cement contracts for 40,000 bbl. were awarded last summer at a price of $1.92 to $1.96 per bbl., delivered.

Milwaukee Cement Bids

THE Milwaukee purchasing board and representatives of the Building Materials Co-operative Association will argue their dispute over cement bids before the marketing commission at Madison, Wis., at an early date. The co-operative association's cement bids for 1930 were $2.60 a bbl., 7 cents more than the 1929 figure. The city contends the price should be lower as cement at the mills is 3 cents a bbl. cheaper.—*Milwaukee* (Wis.) *Journal.*

Foreign Abstracts and Patent Review

Effect of Storage on Cements. Dr. Haegermann determined the variations in the properties of five ordinary portland cements and eight "high grade" portland cements stored in paper sacks in a shed. The shed had brick walls and a wooden roof, and at least one of the sliding doors was kept open during the day. The bags were placed in two rows and the samples taken after two, four and nine months from the upper part of the bags. After 18 months the entire contents were screened on a 12-mesh screen, the residue weighed and samples for testing obtained in different ways. The cements were tested for strength, setting conditions, fineness, volume weight, and loss on ignition.

The decrease in strength of the "high grade" portland cement was relatively smaller than that of the ordinary portland cement, even though more lumps had formed in the former. In all instances the initial strengths were affected more than the 28-day strengths, and the compressive strength again more than the tensile strength. After two months of storage the "high grade" cements showed no essential difference in quality as compared to the quality at the start of the storage. But the 3-day compressive strength decreased on the average 8% after four months and 21% after nine months; the decrease in tensile strength was less. After a storage of nine months of the eight "high grade" cements, seven still complied with the requirements for "high grade" cements. After 1½ years of storage, 7 were still "high grade" by test of the cement screened from the lumps and two by testing the average cement of each bag.

The sets were retarded by storage, the setting period being more than ten hours after nine months of storage. The longest setting period is reached by the "high grade" portland cement after about nine months, by the ordinary portland cement after about one and one-half to two years; but after that time the setting periods shorten again. The volume weight is not decreased significantly in storage and the losses on ignition are increased considerably. Considering all variations in the properties as affected by storage, the "high grade" cement does not deteriorate more than ordinary portland cement. But since in all cements the initial strengths were affected more than the strengths after 28 days, and since the high quality of a cement is of special importance for the initial strength, it is recommended to recheck the high quality of the "high grade" cements which have been stored for a longer period, by determining the three-day strength.—*Zement* (1929), **18, 34**.

Uruguayan Cement Specifications. New specifications for portland cement, which is to be imported into Uruguay, are: Retained on the 76-mesh sieve, less than 1% and on the 178-mesh sieve, less than 12%. Setting of the normal mix must not start before 35 minutes, and must not terminate before 3 hours nor after 10 hours. Tensile strength of the 1:3 normal mortar must be at least 313 lb./in.^{2} after one day storage in damp air and during six days' storage in water. Chemical analysis: Loss on ignition, 4%; insoluble residue, 0.85%; sulphuric anhydrite, 2%; magnesium oxide, MgO, 4%. In the LeChatelier volume consistency test the needle points should not extend more than 5 mm. (0.2 in.) after the test is concluded. —*Zement* (1929) **18,** *37*.

New Italian Cement Specifications. The Italian Cement Specifications of 1927 have been amended by ministerial order of April 4, 1929, with respect ta alumina, high-early-strength, blast furnace and puzzolanic cements. High-early-strength cement must not contain more than 3% magnesia and 1.5% sulphuric anhydrite. Specific gravity must be 3.05; the maximum residue on the 76-mesh sieve should be 2%, on the 178-mesh screen, 15%. The setting period must start not before one hour and terminate inside of 6 to 10 hours. Minimum tensile strength should be 20 kg/cm.^{2} after 3 days; 25 km./cm.^{2} after 7 days, and 30 kg./cm.^{2} after 28 days; the compressive strength, 250 kg./cm.^{2} after 3 days, 350 kg./cm.^{2} after 7 days, and 500 kg./cm.^{2} after 28 days.—*Beton u. Eisen* (1929) 19.

Stages of Gypsum Hydration. Goslich states that knowledge of the water of crystallization contents at the different stages of gypsum hydration is too indefinite to effect a thorough improvement in the method of burning stucco gypsum. The ideal stucco gypsum is obtained by driving 1½ molecules of the two molecules of water of hydration from the raw gypsum. The use of the term hemi-hydrate for the product is not entirely logical, for two molecules of sulphate of lime ($CaSO_4$) combine with one molecule of crystal water.

According to van't Hoff, the minimum temperature for the conversion of double hydrate into hemi-hydrate is 224.6 deg. F. According to Le Chatelier, the conversion takes place rapidly and without difficulty at 262.4 deg. F. From van't Hoff, the soluble anhydrite occurs at 199.4 deg. F., the insoluble at 146.4 deg. F.; the nature of this action is due to a certain dissociation tension. The water of hydration can escape only when the pressure of the free water vapors weighing down upon the gypsum is lower than the dissociation tension or liberation pressure. This liberation pressure is 971 mm. of mercury at 224.6 deg. F. for the first 1½ molecules. Since the steam pressure of the free water at the same temperature is only 970 mm. of mercury, the liberation pressure starts here to exceed the steam pressure of the free water. This temperature is designated by van't Hoff as the *fusion point* of gypsum.

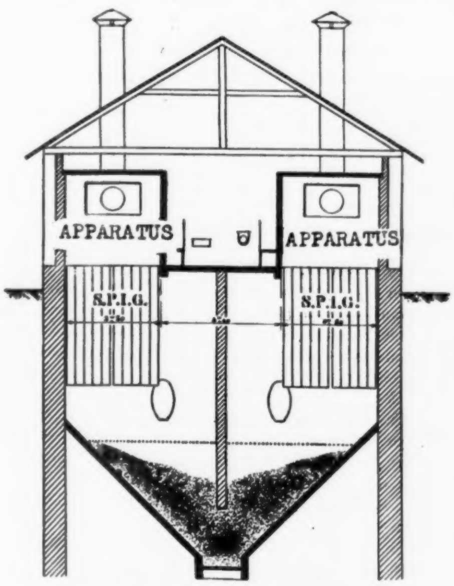
Water boils of course at 212 deg. F. and thereby overcomes the normal atmospheric pressure of 760 mm. of mercury. The water of hydration of the gypsum reaches the same liberation pressure at 214.7 deg. F. and this temperature is therefore to be designated as the *boiling point* of gypsum. The last traces of the water of hydration require only a liberation pressure of 588 mm. mercury column, which corresponds to a steam pressure of free water at 199.4 deg. F. This explains why soluble anhydrite is produced at this temperature after the first 1½ molecules have been driven off. A temperature of 146.4 deg. F. suffices to produce the insoluble anhydrite, hence the liberation pressure is only 175 mm. mercury, corresponding to the steam pressure at this temperature.

Since the water can be split off only when the liberation pressure overcomes the pressure of the water vapor pressure of the gypsum, it is clear that the temperature required for splitting off must decrease when the free water vapor resting above the gypsum is removed. This is made possible by decreasing the atmospheric pressure, that is, working in a rarified space or vacuum. In fact, van't Hoff, working with air pressure (238 mm.), succeeded in lowering the decomposition temperature of the double hydrate (raw gypsum) to 170.8 deg. F. This experiment has been extended further recently by F. Krauss, who split off the first 1½ molecules of water of hydration at a constant remaining rarefaction of the air to 7 mm. mercury column. Decomposition started at 163.4 deg. F. When the reaction vessel was cooled to 32 deg. F., and the experiment started over again, the double hydrate changed to a semi-hydrate at 138.2 deg. F.

Production of stucco gypsum in vacuum would not be so difficult in itself, but it would be hard to reclaim the gypsum dust which in vacuo is in dispersed condition with the water vapor. The hydration is accelerated by the vigorous movement of the steam, that is, by passing an air current through the boiler. The forced air could then be used for agitating the gypsum without use of the agitators, as is done in slurry

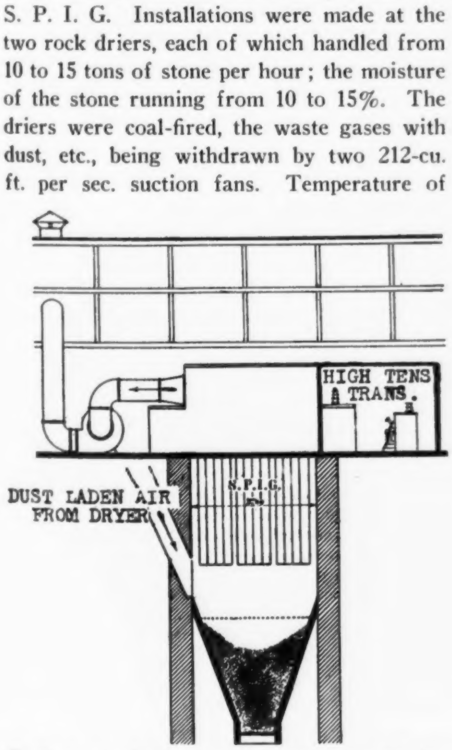
tanks of cement plants. The water vapor could be removed easier, if the air is preheated. For some reason an American patent issued in 1902 and now expired, has not been put into general use.—*Tonindustrie-Zeitung* (1929), **53**, 80.

Electrical Dust Precipitators at the Ranteil (French) Cement Mill. After several years of experimentation with different types of dust collectors, La Société de Chaux et Ciments du Languedoce, operating a limestone crushing plant and portland cement mill at Ranteil, France,



Electrical dust precipitators at rock driers of a French cement mill

recently equipped this operation with electrical precipitators. These were supplied by the Société de Purification Industrielle des Gaz, a French concern commonly called the S. P. I. G. Installations were made at the two rock driers, each of which handled from 10 to 15 tons of stone per hour; the moisture of the stone running from 10 to 15%. The driers were coal-fired, the waste gases with dust, etc., being withdrawn by two 212-cu. ft. per sec. suction fans. Temperature of



End view of the precipitator installation

the waste gases was about 176 deg. F.

The S. P. I. G. precipitating apparatus was placed between the discharge end of the driers and the suction fans, as illustrated in the accompanying sketches. The manufacturers' rated guarantee to trap 96% of the dust in the gases is said to have been surpassed in actual operation. As an instance, during an 18-hr. operation day, over 6 tons of dust were recovered; this dust was of sufficient fineness to leave only a 10% residue on the 4900-mesh sieve (metric screen) and contained from 3 to 4% moisture. Power consumption was about 1.5 kw. per hour.

Dust from the limestone crushers was recovered by these precipitators, the discharge end of the crushers being enclosed and the dust sucked out of the stone into large ducts running to the electric precipitators. The precipitators handled dust-laden air at a rate of 141 cu. ft. per sec. and recovered over 1320 lb. of dust per hr. with an electrical consumption of about 1.5 kw. per hr.

The raw and finish cement grinding mills, the first with a capacity of 8 tons per hr. and the second of 4 tons per hr., were hooked up with this type of precipitator. Installation of the precipitators over the silos facilitated operation, the collected dust merely dropping into the cement storage. These precipitators handled cement dust-laden air at the rate of 106 cu. ft. per sec., recovering approximately 6½ tons of cement dust per 20 hr.—*Rev. de Mat. de Constr. et de Trav. Pub.* (1928), 226, 264-266.

German Cement Industry in 1928. During 1928 the German cement associations marketed 7,570,000 metric tons of cement as compared to 7,340,000 tons in 1927. Adding the domestic consumption of the iron industry from its blast furnace cement plants, of the cement plants not attached to the associations, and the imports of cement, the total turnover was 8,400,000 tons, from which cement exports of about 1,000,000 tons should be deducted.

Cement production in Germany has not kept pace with that of other countries because of scarcity of capital throughout the building industry. Thus, in spite of its high technical standing, the German cement industry cannot consider itself on a level in economic competition with the same industries of most of the foreign industrial countries. Therefore, its joining of an international cement cartel would not at the present be to advantage, for it might result in further decrease in export and also open the way to a decided increase of cement imports which during the last year were more than double those of 1927. Accordingly, the efforts of the committee on economy of the League of Nations to secure a universal lowering of the tariff rates for cement with the purpose of removing the cement tariff entirely within a few years, is of special significance. These efforts would be justifiable provided production conditions in the various countries were alike in some measure. But the actual conditions appear quite different with their great differences in wages, coal prices, freight rates and taxes; and very considerable assimilation is hardly to be expected for many years to come.

The German cement industry has territorial protective agreements with the Scandinavian countries, Poland, Austria and Switzerland, is negotiating with France, and in 1928 made special agreements with Holland and a few small east European countries. The stability in cement prices was maintained in 1928 despite an 8% increase in production costs in 1928, due to shortened working hours, increased wages, increase in cost of coal, etc., which was absorbed in smaller profits for the producers. The increase in railway freight rates, effective in October, 1928, was borne by the consumer, yet in view of the competition of outsiders in the industry, special agreements had to be made in certain territories, resulting in a decrease of receipts of about 8% in the West German Cement Association. Should the outsiders continue this ruinous competition, there is danger of dissolution of the cement associations, particularly the West German; with consequent violent fluctuations in prices the effects of which upon the building industry cannot be overlooked. —*Abstract of Special Report from the German Cement Associations.*

[Our American cement industry would be in *fine shape* if the League of Nations should effect an elimination of duty on cements, for then we would get all the cement we needed from European countries where labor and other production costs are so low.—The Editor.]

Air-Tight Discharge for Shaft Kilns and Coolers. The individual discharge openings are closed air tight by means of two or more gates which are closed one after the other, although they may be closed simultaneously. A more effective seal against air circulation is thus obtained.—*German Patent, Arno Andreas,* No. 481,058.

French Cements. H. Passow gives the names of the French cements, compares the French cement standards with the German standards, and describes also methods of testing. The tremendous importance of the correct combination of coarse and fine aggregates for making concrete is recognized.

The names of the French cements and their English equivalents are as follows:

Ciment a hautes resistances (superciment) —high grade cement.

Ciment portland artificial—artificial portland cement.

Ciment portland—portland cement which may have admixtures.

Ciment prompt—Roman cement.

Ciment naturel—natural cement.

Ciment de Grappiers—Grappier cement—(non-slaking ground hydraulic lime.)

Ciment de laitier—slag cement (hydrate of lime and slag sand).

Ciment fondu—(elektro fondu)—fused cement (alumina cement).

Ciment portland de fer—iron portland cement.

Ciment de haut fourneau—blast furnace cement.

The French cements are arranged as follows, according to their minimum tensile strength of 1:3 mortar specimens after 7 and 28 days' storage in water:

	Kg. per sq. cm.* 7 da.	28 da.
Ciment prompt normal—normal Roman cement	3	5
Ciment prompt superieur—super Roman cement	6	10
Ciment de grappiers normal—normal grappier cement	6	10
Ciment de grappiers superieur—super-grappier cement	10	15
Ciment de laitier normal—normal slag cement	6	10
Ciment de laitier superieur—super slag cement	10	15
Ciment de laitier exceptional—exceptional slag cement	15	20
Ciment portland normal—normal portland cement	10	15
Ciment portland pour beton arme—portland cement for reinforced concrete	15	20
Ciment portland pour travaux exceptionnels—portland cement for exceptional works	20	25
Ciment portland a hautes resistances—high-strength portland cement	30	30
(After 2 days, 22 kg. per sq. cm.)		

The tensile strengths for the high-grade cement are projected.

*One kg. per sq. cm. is 14.223 lb. per s. in.

China's Cement Industry. Dr. A. Leonhard states that the importation of cement to China has decreased considerably during recent years until now only Japan is the chief exporter of cement, landing it at low prices because of large overproduction. Excluding the British plant near Hongkong and a few smaller Japanese plants, about 70% of the cement produced in China comes from Chinese-owned and Chinese-financed plants. Of these the largest, the Chee Sin Portland Cement Works near Tongshan, about 70 miles northeast from Tientsin, produces about 1,500,000 bbl. a year. Before the World War, this plant operated two kilns, using the dry process, but has since added four F. L. Smidth kilns, using the wet process with waste heat boilers. Limestone, clay and coal deposits are close by, but gypsum must be imported for the Chinese fibered gypsum is not suitable. This company's other plant, located in the middle Jangtse valley in the Hupeh province, produces 900 bbl. per day, for which coal is shipped 1165 miles by sea and rail.

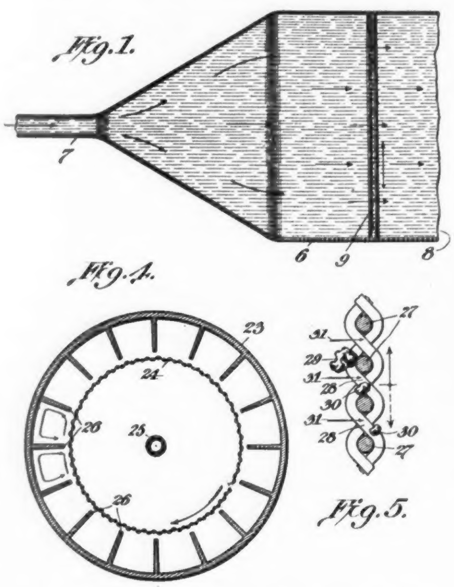
The second largest plant, the China Portland Cement Works in Lungtan, is located on the Jangtse river near Nanking adjacent to limestone and clay deposits, and is equipped to produce 750,000 bbl. annually, chiefly by the wet process. Another plant, the Shanghai Portland Cement Works, on a tributary of the Jangtse near Shanghai, produces 370,000 bbl. annually by the wet process, limestone and clay being hauled 60 miles. Ocean-going coal ships can moor at the plant and shipments of cement are made to Shanghai by water.

Wages are quite low, common labor averaging about 25 to 50c per 10 hr. day; skilled labor, 30c to 50c daily.—*Zement* (1929) 18, 2.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Superintendent of Documents, Government Printing Office, Washington, for each patent desired.

Net Method of Screening Wet Material. A method of screening wet material which employs a principle that appears to be quite new has been patented by Louis S. Deitz, of Rifle, Colo. (U. S. Patent No. 1,710,208, Apr. 23, 1929.) The principle is that a screen moving across a flowing stream of water which carries the solids to be screened will keep out much finer particles than the screen openings. In other words, it acts as a much finer screen without the disadvantages which are ordinarily found when a fine screen is used to separate wet materials. The patent paper is unusually complete in that it gives the result of tests which show the efficiency of the new method and also the capacity.



Details of a simple form of screen for wet materials

Fig. 1, taken from the patent paper, shows a simple form of the apparatus. The feed comes in at 7 and spreads out to meet the screen at 9 in a wider portion of the flow. This screen moves back and forth across the flow at a speed which must be substantially greater than the rate of flow. A second form, Fig. 3, employs a circular screen. The flow comes in from the vessel which surrounds the screen, passes through the screen and goes out through holes in a central pipe which forms the discharge for fine material. The coarse material sinks to the bottom of the outer vessel and is discharged through a pipe and valve.

In this second form the screen may be either rotated continuously or reciprocated. The latter method seems to be preferred by the inventor as he says that the rotary motion creates a circular current that interferes with screening. However, the formation of this circular current may be prevented by placing radial baffles in the space around the screen as shown at Fig. 4.

The table below shows the results with the circular screen with a reciprocating motion. It will be noted that the product made with a ½-in. stroke contained only 0.5% of material coarser than 100-mesh and only 6.6% coarser than 150-mesh although it was made through a 60-mesh screen. This is considerably finer than cement raw material is ordinarily ground, for instance. It is also worth noting that the pulp, containing 35% of solids, is considerably thicker than could ordinarily be used with fine screens on wet material.

SCREEN CLOTH, 60-MESH. RATE OF VIBRATION, CONSTANT AT 150 PER MINUTE.

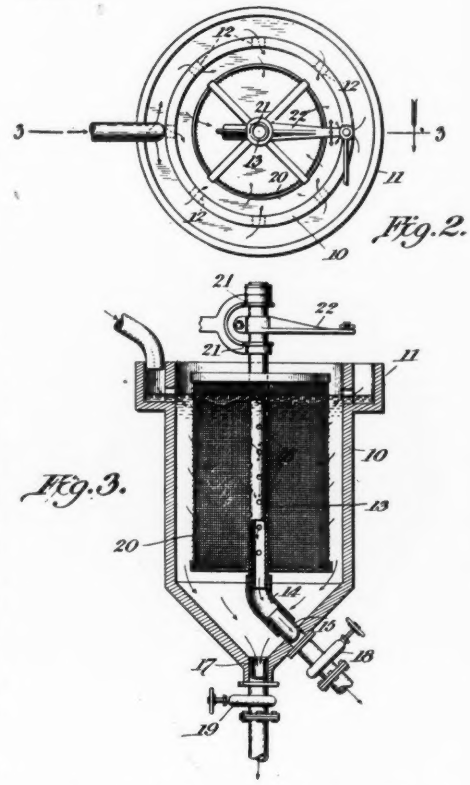
Size of Feed		½-in. Stroke	1-in. Stroke	3-in. Stroke
-20 to -40	7.2%	0.0%	0.0%	0.0%
-40 to -60	6.0	0.0	0.0	0.0
-60 to -100	25.6	0.5	1.4	5.8
-100 to -150	21.0	6.6	10.0	21.0
-150	40.2	92.9	88.6	73.2

Density of feed, 35% solids.

Density of discharge through screen, 18% solids.

Rate of screening, 3.76 grams solids per sec. per sq. in. of screen cloth.

With the rotating screen the product is much coarser, indicating a lower efficiency, as the following table shows. This is said to be due to the agitation of the pulp on the feed side of the screen. The capacity before clogging is stated to have been less with the rotating than the reciprocating form.



A second form of the invention employs a circular screen

SCREEN CLOTH, 60-MESH. SAME SIZE FEED AS IN PREVIOUS TESTS, ALSO 35% SOLIDS. SIZE OF MATERIAL PASSING THROUGH SCREEN.

	60 R.P.M. 39 ft./m.	113 R.P.M. 89 ft./m.	200 R.P.M. 157 ft./m.
60	0.0%	0.0%	0.0%
-60 to -100	6.7	6.6	5.0
-100 to -150	16.0	18.0	21.0
-150	77.3	75.4	74.0

The inventor's first claim, covering the process is:

"The method of separating materials which consists in creating a flowing stream of said materials, causing said stream to flow through a screen at right angles to the screen, moving said screen transversely to the stream, and preventing the formation of material transverse movement of the stream adjacent to the receiving side of the screen."

Fig. 5 shows what is supposed to be the action of the screen in keeping a coarse particle back and allowing a fine particle to pass, although both could pass through the wires if the screen were standing still.

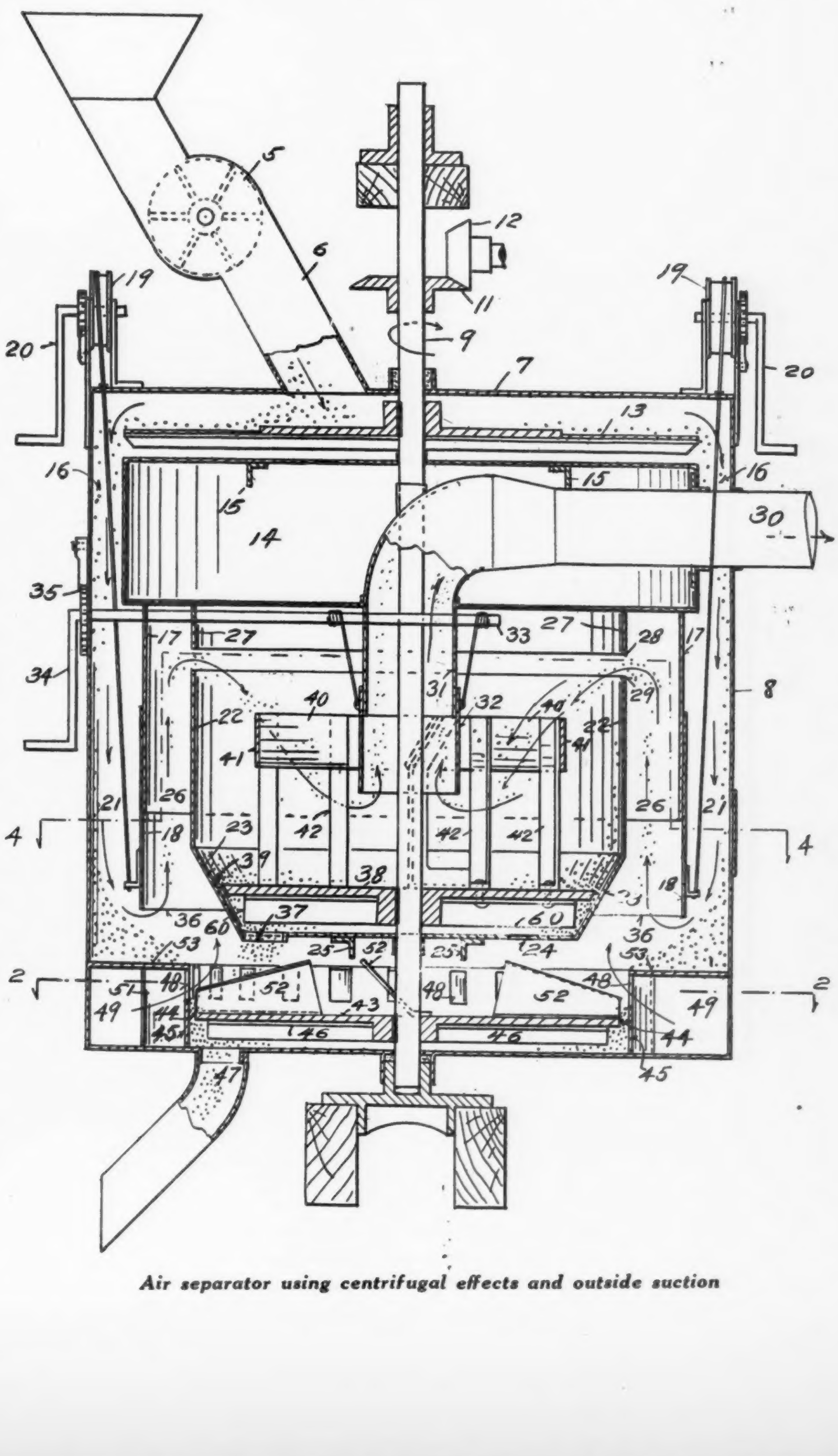
It would be interesting to know if this method could be applied to coarser screening than that shown in the tables.

Air Separator—In the air separator shown the moving parts are employed for centrifugal effects, suction (and blast if desired) being furnished by an outside fan, not shown in the cut. The feed falls on a whirling disk which spreads it thin and drops it through a narrow annular passage. From this it falls through a somewhat wider passage, the depth of which is regulated by a sliding apron, moved by cords and pulleys. The heavier tailings cling to the side in these passages and fall directly to the bottom. The medium and fine particles rise inside the apron and enter a tub-like receptacle where they meet moving blades which set up centrifugal action, throwing the heavier particles to the side. The lighter enter the suction of an outside fan and are drawn out, presumably to be deposited in a cyclone of the ordinary collecting type. The heavier (medium) particles go through a very narrow annual passage to a whirling plate from which they are scraped off by stationary scrapers. They fall on a third whirling plate from which they, and the coarser tailings which followed the wall down, are scraped off into a passage that leads to the outside of the machine.

As the tailings are removed intermittently by the scrapers it follows that the passages by which they are discharged are sealed for the greater part of the time. This gives a stronger vacuum to the suction of the fan and causes a pulsating effect which is said to be more effective than a suction of uniform strength in separating the fine from the coarse. The arrangement of passages is such that the heavier particles are driven by centrifugal force out of the path of the air currents carrying the finer particles. Pressure may be obtained by connecting the blast side of the fan to the annular chamber around the bottom of the casing from which ports lead inwardly. This gives a stronger upward current through the passage between the sliding apron and the tub-like receptacle, which should be more effective in making separations on the coarser mesh sizes.—*J. W. Dreisbach.* January 8, 1929. Patent No. 1,698,361.

Treatment of Ends and Edges of Burned Gypsum Boards. The process of restoring the bond of paper surfacing to a partially calcined or burned gypsum board core layer at its marginal edges, comprising assembling warm boards into piles, wetting the burned margins with an aqueous fluid adapted to saturate the paper and core body at such margins, and to rehydrate the plaster of paris therein, and evaporating the excess fluid by the retained heat in the assembled piles of treated gypsum board.—*Sewell L. Avery, Jr., and M. H. Basquin (asignors to U. S. Gypsum Co.),* U. S. Patent No. 1,725,243.

Plaster Board. The present invention is concerned with an improved method and means for finishing the edges of a plaster board which in place of troweling the edges provides a finished form edge by a reciprocation of a straight edge in the direction of travel of the plaster board, producing a somewhat harder finished edge and therefore producing a board better adapted for certain purposes.—*John Schumacher,* U. S. Patent No. 1,718,712.



Air separator using centrifugal effects and outside suction

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly car loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Nov. 2	Sand, Stone and Gravel Week ended Nov. 2
Eastern	3,029	13,421
Allegheny	2,968	8,098
Pocahontas	349	1,125
Southern	734	8,356
Northwestern	889	5,791
Central Western	546	10,565
Southwestern	480	7,574
Total	8,995	54,930

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1928 AND 1929

	Limestone Flux		Sand, Stone and Gravel	
	1928	1929	1928	1929
	Period to date		Period to date	
District	Nov. 3	Nov. 2	Nov. 3	Nov. 2
Eastern	131,964	147,904	502,981	507,157
Allegheny	152,202	158,128	335,605	326,450
Pocahontas	20,621	16,733	36,297	44,178
Southern	25,912	26,291	469,366	391,266
Northwestern	58,900	50,087	297,100	283,067
Central Western	19,515	23,102	454,084	469,161
Southwestern	18,148	21,977	279,265	305,484
Total	427,262	444,222	2,374,698	2,326,763

COMPARATIVE TOTAL LOADINGS, 1928 and 1929

	1928	1929
Limestone flux	*427,262*	*444,222*
Sand, stone, gravel	*2,374,698*	*2,326,763*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning November 30:

SOUTHERN FREIGHT ASSOCIATION DOCKET

48045. **Glass sand,** from Morehead, Ky. (when from stations on the Morehead and North Fork R. R.), to Kingsport, Tenn. Present rate, 620c per net ton. Proposed rate on glass sand, carloads (See Note 3), from and to points mentioned, 200c per net ton.

48082. **Sand, gravel, crushed stone, etc.,** from Montgomery, Ala., to St. Marks Junction, Fla. It is proposed to publish rate of 170c per net ton on sand, gravel, crushed stone, slag, rubble stone, broken stone and chert, in straight or mixed carloads (See Note 3), from Montgomery, Ala., to St. Marks Jct., Fla., in lieu of the present rate of 150c per net ton, which was published as result of clerical error.

48121. **Stone, marble, calcite, limestone, slate or whitestone,** as described in Item 359-A, Agent Glenn's I. C. C. A-657, from southeastern and Carolina points to Luckey, O. Combination rates now apply. Proposed rates on the commodity mentioned, from Alabama, Georgia, North Carolina and Tennessee shipping points to Luckey, O., same as in effect to Toledo and Pemberville, O. Statement of the suggested rates from the origins involved will be furnished upon request.

48177. **Soapstone, crushed, ground or pulverized,** carloads, from Henry, Va., to Tuscaloosa and Holt, Ala., and Memphis, Tenn. It is proposed to revise rates on soapstone, crushed, ground or pulverized, carloads, minimum weight 50,000 lb., from Henry, Va., to Tuscaloosa and Holt, Ala., to be 500c per net ton, and to Memphis, Tenn., $5.90 per net ton. Rate proposed to Tuscaloosa and Holt, Ala., is made the same as the proportional rate approved under Submittal 46488, from Rockfish, Va., to Tuscaloosa, Ala. The suggested rate to Memphis, Tenn., is made the same as the existing rate to Mobile, Ala.

48178. **Chert, gravel, sand, slag and stone,** from Pkin, Va., to stations on the A. C. L. R. R., S. A. L. Ry. and short line connections in Virginia, North Carolina and South Carolina. It is proposed to establish commodity rates on chert, gravel, sand, slag and stone from Pkin, Va., to stations on the A. C. L. R. R. and S. A. L. Ry. and short line connections in Virginia, North Carolina and South Carolina east of the Wadesboro, Cheraw, Florence line, adjusted with relation to rates in effect from Alco, Va.

> **Note 1—Minimum weight marked capacity of car.**
>
> **Note 2—Minimum weight 90% of marked capacity of car.**
>
> **Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.**

48184. **Sand, gravel, crushed stone, slag, chert, etc.,** between points in southern territory. It is proposed to substitute the following preamble note in lieu of the present preamble note that is now carried in Section 2, page 11 of Supplement 59 to to Agent Glenn's Freight Tariff 88-A, I. C. C. A-655, applying on sand and gravel, slag, stone and chert, carloads, between points in southern territory:

"In the absence of specific rates in Section 1 of this tariff or in tariffs referred to on page 6-A, as amended, rates will be arrived at by use of the mileage scales shown below, whichever, according to its application, yields the lowest rates, and the rates so made will apply via all lines (see exception) shown in Lists 1 and 2, pages 245, 246 and 247 of the tariff as amended, subject to maximum circuity rule shown in Item 55 of tariff, as amended.

"Exception—Rates made by use of single line mileage of the St. L.-S. F. Ry. to and from points located only on St. L.-S. F. Ry. will apply only via St. L.-S. F. Ry. direct."

The proposed change is suggested to clarify the application of the present note and involves no actual change in the rates.

TRUNK LINE ASSOCIATION DOCKET

22241. **Sand,** carloads (See Note 3), from Group 1, Woodbury to Dorchester, Muskee Siding, Atlantic City, Collingswood and Marlton, N. J., and Group 2, Maurice River, Belleplain to Cape May, Ocean City and Wildwood, N. J., to Rocky Hill, N. J., $1.25 per net ton from Group 1 and $1.37 from Group 2. Reason—Rates comparable with others involving similar hauls.

22261. **Fertilizer cortex sand** (silica), carloads, minimum weight 30,000 lb., from Lyndhurst, N. J., to Frederick, Md., 20½c per 100 lb. Present rate, 27c per 100 lb. Reason—Proposed rate compares favorably with rate to Norfolk, Va., Baltimore, Md., and York, Penn.

22274. **Sand** (other than blast, engine, fire, foundry, glass, molding, quartz, silex and silica) **and gravel, carloads (See Note 2), from Kenvil,** N. J., to Weissport, Penn., $1.25 per net ton. (Present rate, $1.40 per net ton.) Reason—Proposed rate compares **favorably with rate from** Wyoanna, Penn., to Lehighton and Weissport, Penn.

22282. **Glass sand,** carloads (See Note 2). Rates from Tatesville, Penn.

To	Prop.	Pres.
Clarion, Penn.	250	261
Binghamton, N. Y.	275	320
Corning, N. Y.	275	27½
Lancaster, N. Y.	275	27½
Lonaconing, Md.	210	*

Rates in cents per 2000 lb. Reason—Proposed rates are fairly comparable with rates from Hancock, Md., and Berkeley Springs, W. Va.

*No through rate.

22283. **Crushed stone,** carloads (See Note 2), from Philadelphia, Penn., to Ardsley, Roslyn, Crestmont and Willow Grove, Penn., 85c per net ton. (Present rate, $1.05 per net ton). Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

22289. (a) **Sand** (other than blast, engine, fire, foundry, glass, molding, quartz, silex and silica sand) **and gravel,** carloads; (b) **sand (blast, engine, fire, foundry, glass, molding, quartz, silex and silica sand),** carloads (See Note 2), from Walnutport, Penn., to Palmerton, Penn., (a) 60c per net ton, (b) 72c per net ton. Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

22297. **Glass sand,** carloads (See Note 2), from Tatesville, Penn., to Niles, O., $2.40 per net ton. (Present rate, 16½c per 100 lb.) Reason—Proposed rate is comparable with rate from Mapleton, Penn., Berkeley Springs, W. Va., and Hancock, Md., to same points.

22299. **Sand and gravel,** other than blast, engine, foundry, glass, molding and silica, carloads (See Note 2), from Susquehanna, Penn.:

To	Prop.	Pres.
Horseheads, N. Y.	$1.10	$1.35
Big Flats, N. Y.	1.25	1.35
Corning, N. Y.	1.25	1.35
Painted Post, N. Y.	1.25	1.35
Coopers, N. Y.	1.40	1.35
Curtis, N. Y.	1.40	3.70
Campbell, N. Y.	1.40	3.70
Savonia, N. Y.	1.40	3.80
Bath, N. Y.	1.40	3.90
Kanona, N. Y.	1.40	3.90

Rates in cents per net ton. Reason—Proposed rates are comparable with rates from Whitney Point, N. Y., to same points of destination.

22302. **Soapstone refuse (stone dust), crushed or ground,** carloads (See Note 2), from Esmont, Va. (Note A), to N. & W. Ry. stations, Bluefield, W. Va., St. Claire, Va., Elkhorn, W. Va., Garbo, Va., Atwell, W. Va., Tusler, W. Va., Verda, Booth, W. Va., Norton, Va., St. Paul, Va., Majestic, Arrow, Ky., East Lynn, W. Va., and various. Rates ranging from $2.20 to $2.30 per net ton. Note A—Applicable on traffic from N. & A. Ry. Reason—Proposed rates are comparable with rates from Rockfish, Va.

22303. **Stone chips or granules, roofing granules,** carloads (See Note 2), from Advance, Gladhill, Penn., Cardiff, Whiteford, Md., Delta and Slate Hill, Penn., to St. Johns and Coldbrook, N. B., 44c per 100 lb. Reason—Proposed rate is fairly comparable with rates on like commodities from and to points in the same general territory.

22309. **Ganister stone,** carloads (See Note 2), from Reedsville, Penn., to New Haven, Conn., 22c per 100 lb. (Present rate, 30½c per 100 lb., sixth class.) Reason—Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

22314. To increase rate of 90c to $1.05 per net ton applying on **sand,** other than blast, engine, foundry, molding, glass, silica, quartz or silex, carloads, also **gravel,** carloads (See Note 2), from Patapsco, Md., to Cromley's Mountain, Md. Reason—Proposed rate is comparable with rates to Bald Friar, Md., Peach Bottom, Benton, Penn., etc.

21904. **Limestone, ground, precipitated or pulverized, and limestone dust,** carloads, minimum weight 50,000 lb., from Sparta and Ogdensburg, N. J., to D. L. & W. points, Passaic and Delaware Branch, New Providence, N. J., to Gladstone, N. J., inclusive, 7½c per 100 lb.

22336. **Sand** (other than blast, engine, foundry, glass, molding, quartz, silex or silica), carloads (See Note 2), from Philadelphia, Penn., to Lenhartsville, Penn., $1.25 per net ton. (Present rate, $1.40 per net ton.) Reason—Proposed rate is comparable with rates from and to points in the same general territory.

22337. **Crushed stone,** carloads (See Note 2), from Honey Creek, Shraders and Naginey, Penn., to Lewistown, Penn., 50c per net ton. (Present rate, 60c per net ton.) Reason—To meet motor truck competition.

22332. **Sand** (other than blast, engine, foundry, glass, molding or loam), **gravel and crushed stone,** carloads (See Note 2), from producing points located within state of West Virginia, also Martinsburg and Frederick groups in B. & O. R. I. C. C. No. 21285 on crushed stone only to stations on the Ravenswood, Spencer & Glenville Branch, Silverton, W. Va., to Spencer, W. Va., inclusive; stations on the Ripley & Mill Creek Valley Branch, Cottageville, W. Va., to Ripley, W. Va.; stations on the Little Kanawha Branch, Hallen, W. Va., to Owensport, W. Va., inclusive. Reason—Proposed rates 10c per net ton higher than present rates named in B. & O. I. C. C. No. 21285, P. S. C. W. Va. No. 3244.

ILLINOIS FREIGHT ASSOCIATION DOCKET

4822-A. **Limestone, crushed or ground** (See Note 3), but not less than 40,000 lb., from Valmeyer, Ill., to various points in C. F. A. territory. Rates per net ton (to representative points):

To	Pres.	Prop.
Akron, O.	$6.10	$4.00
Cincinnati, O.	5.00	3.30
Detroit, Mich.	5.90	4.20
Indianapolis, Ind.	4.40	2.90
Pittsburgh, Penn.	7.00	4.60

5193. **Molding sand,** carloads (See Note 1), from Bowes, Ill., to Mt. Vernon, Ill. Present, class rates; proposed, $2.39 per net ton.

5330. **Stone, crushed or ground,** carloads (See Note 3), from East St. Louis, Ill., to Hillsboro, Ill. Present rate, 81c; proposed, 76c per net ton.

5335. **Sand and gravel,** carloads (See Note 1), from Forreston, Ill. Rates in cents per net ton.

To (I. C. R. R. stations)	Pres.	Prop.
Evarts, Ill.	75	60
Seward, Ill.	75	60
Alworth, Ill.	75	60
Rockford, Ill.	75	68

5336. **Stone, broken, crushed or ground,** carloads (See Note 2), from Bellwood, LaGrange and McCook, Ill., to stations on C. & N. W. Ry. in Illinois. Rates in cents per ton of 2000 lb.:

To (representative points)	Pres.	Prop.
Aurora, Ill.	110	89½
De Kalb, Ill.	130	109½
Freeport, Ill.	140	119½
Peoria, Ill.	170	149½
Waukegan, Ill.	110	89½

5337. **Sand and gravel,** carloads, from Chillicothe, Ill., to I. C. R. R. stations, Peoria, Pekin, South Pekin, Green Valley, Delavan, Emden, etc., Ill. Present rates, class; proposed, $1.01 per net ton.

5356. **Stone, crushed,** in open cars (See Note 3), but not less than 40,000 lb., from Thornton, Ill., to Decatur, Ill. Present rate, $1.01; proposed, 98c per net ton.

5357. **Common sand and gravel,** carloads (See Note 3), but not less than 40,000 lb., from Chillicothe, Ill., to Sherrard, Ill. Present rate, $1.26; proposed, $1.13 per net ton.

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

18385. **Common sand and run of bank gravel,** minimum weight 50 net tons, from Gleasondale (Terminal Division), Mass., to Worcester, Mass. Present, 70 net tons; proposed, 50 net tons. (Not to include any part of connecting line switching charges.) Reason—To meet motor truck competition.

18386. **Common sand and gravel,** minimum weight 50 net tons, from Manchester, N. H., to Candia, N. H. Present, 60 net tons; proposed, 50 net tons. Reason—To meet motor truck competition.

18343. **Limestone, pulverized,** minimum weight 60,000 lb., from West Stockbridge, Mass., to Lee, Mass. Present rate, 10½c; proposed, 5c. Reason—To meet motor truck competition.

SOUTHWESTERN FREIGHT BUREAU DOCKET

18862. **Silica sand,** between points in Arkansas, Kansas, Missouri, etc. To establish the same scale of rates on silica sand, carloads, as described in Item 445 of S. W. L. Tariff No. 114D, between points in Arkansas on the one hand and points in Kansas and Missouri on the other hand, and points in Louisiana and Texas on the one hand and points in Kansas on the other hand, which was the result of order of the Interstate Commerce Commission in Docket 9702. It is desired to place territory outlined above on the same basis as surrounding territory.

18869. **Sand, stone, etc.,** from Oklahoma points to Tulsa, Okla. To establish an intrastate rate of 1c per 100 lb., subject to a minimum per car charge of $9.15 for single line and $12.15 for joint line movement, on sand, rock or stone, broken or crushed, carloads (See Note 1), except when cars are loaded to full visible capacity actual weight will govern, from Long-Bell Spur, Dawson, Garnet, Gray, Howard Branch, Kengle, Price, Rice, Shirk and Weerts, Okla., to Tulsa, Okla., and points within the Tulsa terminal district, on the St. L.-S. F. Ry. and connections. All of the sand producing points enumerated above are located within a radius of 10 miles from Tulsa. Each point is served by paved roads. Consequently, practically all of this traffic is moving by truck, but proponent has assurance that if the rate can be reduced to the proposed figure a very large portion of this traffic can be returned to the rail carriers.

CENTRAL FREIGHT ASSOCIATION DOCKET

23270. To establish on **crushed stone** and **crushed stone screenings,** carloads, from East Liberty, O., to Merriman and Philo, O., rate of 115c. Route—N. Y. C.-B. & O. Present rate, 17c (sixth class), as per C. F. A. Lines Tariff 230A.

23275. To establish on **sand and gravel,** carloads, from Huron and Milan, O., to Glen Jean, Jackson, Portsmouth, Sciotoville and Waverly, O., rate of 165c per net ton. Present rate, 180c per net ton.

23276. To establish on **gravel and sand,** carloads, from Dresden, O., to points in Ohio, rates as shown below (rates in cents per ton of 2000 lb.):

To	Miles	Prop.	Pres.
Lore City, O.	49	95	90
Gibson, O.	51	85	105
Salesville, O.	56	90	105
Quaker City, O.	58	90	105
Barnesville, O.	66	95	105
Bethseda, O.	72	95	140
Belmont, O.	74	95	140
Neffs, O.	88	100	140
Bellaire, O.	93	105	140
Cumberland, O.	....	105	110

Route—Zanesville, O., and the B. & O. R. R.

23277. To establish on **sand, blast, core, engine, filter, fire or furnace, foundry, glass, grinding, or polishing loam, molding or silica,** carloads, from points in Ohio to points in Pennsylvania, rates as shown below:

From	Miles	Prop.	Pres.
Cleveland, O., to E. Pittsburgh, Penn.	154	176	17
Cleveland, O., to Wilmerding, Penn.	153	176	202
Cleveland, O., to Trafford, Penn.	156	176	202
Ashtabula, O., to E. Pittsburgh, Penn.	142	176	189
Ashtabula, O., to Wilmerding, Penn.	141	176	189
Ashtabula, O., to Trafford, Penn.	144	176	202
Erie, Penn., to E. Pittsburgh, Penn.	161	176	189
Erie, Penn., to Wilmerding, Penn.	160	176	189
Erie, Penn., to Trafford, Penn.	163	176	202

Route—Pennsylvania R. R. direct.

Proposed rates in cents per ton of 2000 lb.

23333. To establish at Hubbard, O., an intramill charge on **refuse sand,** carloads, moving between loading track and sand pile of the Valley Mould and Iron Corp. of $3.15 per car. Present rate, industrial switching charge of 25c per ton, minimum 25 tons, per Item 770.

23349. To establish on **crushed, ground or pulverized limestone,** in boxes or sacks, or in bulk, carloads, minimum weight 40,000 lb., from Gibsonburg and Woodville, O., rates as shown in Exhibit A attached. Present rates, as shown in Exhibit A attached.

EXHIBIT A

Commodity: Crushed, Ground or Pulverized Limestone, in Barrels, Boxes or Sacks, or in Bulk, Carloads, from Gibsonville and Woodville, O.

To	Prop. rates	Sixth class	60% 6th class
Duluth, Minn.	26	43	26
Fond du Lac, Wis.	23	38	23
Green Bay, Wis.	17½	29½	17½
Madison, Wis.	23	38	23
Oshkosh, Wis.	23	38	23
Portage, Wis.	23	38	23
St. Paul, Minn.	26	43	26
Wausau, Wis.	23	38	23
Winona, Minn.	23	38	23
Points in Group 8* (2)	16	26½	16
Points in Group 10† (2)	17½	29½	17½

*Via all rail, as provided in C. F. A. Tariff 155; Manitowoc, Wis., is representative.

†Via all rail, as provided in C. F. A. Tariff 155; Marinette, Wis., is representative.

(2) Via car ferry routes.

23351. To restrict the rates on **crushed stone, rip rap and rubble** from Chicago and west bank Lake Michigan ports, both the local and proportional application, making the rates apply only on shipments when loaded in open top cars.

23354. To establish on **crushed stone,** carloads, from Thrifton, O., to East Monroe and Leesburg, O., rate of 50 cents per net ton. Present rate—60c.

23372. To cancel present commodity rates on **sand and gravel,** carloads, published in C. C. C. & St. L. Ry. Tariff 1703-O, from Cleves, O., to points in Kentucky on the C. N. O. & T. P. Ry., permitting the combination of rates to and from Cincinnati, O., to apply in lieu thereof.

23380. To establish on **crushed stone,** carloads, from Greenfield, O., to Minford, O., rate of 85c per net ton. Route—Via D. T. & I., Gregg, O., C. & O. Ry. Present—No commodity rates at present in effect.

23381. To establish on **sand and gravel,** carloads, from Lafayette, Ind., to Belshaw and North Hayden, Ind., rate of 85c, and to Cooke, Ind., rate of 90c per net ton. Present rate, sixth class.

WESTERN TRUNK LINE DOCKET

7004A. **Silica,** carloads, minimum weight 40,000 lb., from Olive Branch and Cox, Ill., to Kansas City, Mo., Omaha, Neb., and points taking same rates in W. T. L. Tariff 1R, I. C. C. A1922. Present, class rates; proposed, $5.11 per ton of 2000 lb.

7089. **Stone, natural, granite, rough quarried,** minimum weight 60,000 lb., from Salida, Colo., to Barre, Vt. Present—No joint rates, Chicago combination is 91c; proposed, 63½c per cwt.

Wallboard Rates

FINDINGS of undue prejudice with respect to rates on fiber wallboard as compared with rates on plaster wallboard, have been made by the Interstate Commerce Commission in a report by Commissioner McManamy in No. 17006, embracing 16491 and 18958. The report holds that the assailed rates on fiber wallboard were not unreasonable in the aggregate. The evidence was convincing that, although fiber wallboard should be on a somewhat higher rate basis than plaster wallboard, existing disparities were in numerous instances unjustified.

The problem presented was rather a perplexing one and it was not persuaded that a solution proposed by complainant was a proper or practicable one, the Commission stated in summing up its conclusions and setting forth its findings. The report stated in part:

On the question of mixed-carload practices, it seems clear to us that if higher rates are warranted on plaster wallboard in straight carloads than on plaster in straight carloads, then there is no justification for applying the plaster rates on mixed carloads of plaster wallboard and plaster. On the other hand, if the same rates are proper for application on both of these commodities we see no reason why such rates should not apply to mixed-carload shipments. In New England Plaster, 41 I. C. C. 687, we approved rates on plaster board in straight carloads or in mixed carloads with plaster and plaster products from the Garbutt-Oakfield district in New York, New Brighton, N. Y., and Chester, Penn., to New England territory and most of eastern trunkline territory on the basis of 25 cents per ton or 1.25 cents per 100 lb. higher than the corresponding rates on plaster.

Louisiana Gravel Rates Termed Discriminatory

THE Louisiana public service commissioner has filed suit in United States District Court for the Eastern District of Louisiana to enjoin the Federal Government from enforcing the order of the Interstate Commerce Commission, date of June 30, 1929, which prescribes intrastate freight rates on gravel, sand, shells and crushed stone. The petition asks that the rates prescribed be declared unconstitutional and of no effect.

The grounds on which unconstitutionality is claimed are that the commission order "prescribes joint rates in western Louisiana and fixes divisions and apportionment of joint rates by prescribing separate ferry charges for ferry transfers across the Mississippi river at New Orleans, Baton Rouge, Harahan, Angola, Natchez and Vicksburg."

The rate schedule, according to the petition, is discriminatory against Louisiana in favor of ports in Texas. The constitutional amendments violated by the Interstate Commerce Commission's order are the ninth and tenth, the petition sets forth.

The point stressed by the public service commission is that of states' rights.

Proposed New Specifications for Concrete and Aggregate

C. GRAY, who is district manager of the American Aggregates Corp., proposes a new specification for concrete and for coarse aggregate, in an article in the October issue of the *National Sand and Gravel Bulletin.*

After explaining that the strength of mortar depends upon the proportion of water to cement and of sand to cement, he said:

"Since the strength is controlled by the water, cement and sand ratio, and since the mortar is the most expensive part of the concrete, the economy must necessarily lie in the amount of mortar used. The amount used is dependent entirely upon the amount of voids in the coarse aggregate. The voids should be filled and sufficient mortar added to make it possible to finish the surface. This excess, or finishing mortar, should be equal to approximately six-tenths the volume of voids for ordinary conditions. It can then be easily seen that the economical coarse aggregate is one with the minimum amount of voids. This is controlled by the character of the particles; that is, whether they have rounded edges which permit them to fit more closely together, or whether they have sharp angular edges which hold them apart, and the uniform gradation from coarse to fine. These features will cause the voids in the coarse aggregate to vary as much as 10%."

To show the difference in cost due to voids, he assumes a coarse aggregate with 35% voids used with a 1:2 mortar and says:

"Since we are not going to provide any excess mortar it will take one cubic yard or 27 cu. ft. of coarse aggregate to produce a cubic yard of concrete. It will require 0.35 of 27 cu. ft., or 9.45 cu. ft. of mortar. Now, let us assume that we are to make another cubic yard using the same kind of mortar, but using a coarse aggregate with 45% voids. This will require 0.45 of 27 or 12.15 cu. ft. of mortar. We then have a saving in the first case over the second of 12.15 cu. ft. of mortar. Assuming that the sand and cement in this mortar make 20% more mortar than the volume of sand it would contain, an amount of cement by volume equal to $(2.7 \div 1.20) \div 2$ or 1.125 cu. ft., which is equal to 0.281 bbl. Placing a value of \$2.25 per bbl. on this cement, we would have a saving of 63 cents per cubic yard."

He works out the general case algebraically, obtaining a formula which may be embodied in a concrete specification as follows:

"The concrete shall be composed of cement, fine aggregate and coarse aggregate. The ratio of cement to fine aggregate shall be . . . part of cement by weight to . . . parts of fine aggregate by weight. The amount of coarse aggregate used shall depend upon the weight per cubic foot of coarse aggregate and be determined by the following formula:

$$X = \frac{\text{ft.}(1 \div C)(62.4S)W}{1.6(62.4S - W)W_1}$$

Where
X=Total weight of coarse aggregate per batch.
ft.=Total weight of fine aggregate per batch.
W=Weight per cu. ft. of coarse aggregate.
W_1=Weight per cu. ft. of fine aggregate.
S=Specific gravity of coarse aggregate.
C=Percentage of bulking of sand due to addition of cement and water.

The full calculation is given in the article, also the precautions to avoid uniformity from bulking and differences in gradation of sand. Tests for these should be made by actually mixing the sand, water and cement together on the job.

Proportioning by weight is recommended. The advantages of this specification, according to its author, are:

1. It maintains a constant sand-cement ratio which with a proper water control will produce a uniform strength concrete.

2. It provides for a minimum amount of excess mortar and at the same time provides for a workable concrete at all times. As has been demonstrated above, the saving in excess mortar may amount to a saving of as much as 12.6 cents per square yard of pavement.

3. It places a premium on a well-graded coarse aggregate as well as a uniformly high-strength cement.

"It is not claimed that the above specification will eliminate all of the factors which produce a variation in the strength of concrete (such as water control, the fact that it is impractical to determine the strength of each batch of cement, etc.), but it will eliminate one of the most important factors which is a variable mortar ratio. A definite amount of cement per cubic yard of concrete is now generally specified, and in order to keep it constant when there is a variation in the voids of the coarse aggregate, one must vary either the mortar ratio or the mortar-coarse aggregate ratio. The first will result in a variation in the strength of the resulting concrete and the second will result in either a waste of mortar (the most expensive component part of the concrete) or a concrete which cannot be properly finished. It should be remembered that any excess mortar over and above that required for finishing does not add to the strength of the concrete and is a waste of money. The above specification also eliminates this waste by providing a minimum amount of mortar, as well as a constant mortar ratio, and therefore a more nearly constant strength."

Specifications for Coarse Aggregate

For reasons connected with the nature of gravel deposits, which are well discussed in the paper, Mr. Gray believes that the maximum size of coarse aggregate should be 1¾ in. He therefore proposes this specification:

	Per cent
Passing 1¾-in screen	100
Retained on ¾-in. screen	20 to 50
Retained on ¼-in. screen	95 to 100
Retained on No. 8 sieve	97 to 100

"Most specifications permit 5% to pass the No. 8 sieve, but this is not necessary from the producer's standpoint, as modern methods can easily screen it down to 2 or 3% even in a fine deposit. This feature also guarantees a clean product, as it necessitates an abundance of washing water and screening capacity. You will find that practically every sample rejected for clay and silt will run high on the percentage passing the No. 8 sieve."

This is followed by a discussion of proportioning by voids. In the concluding paragraph, he says of the policy of his company:

"We believe in and are agreeable to being required to produce materials which will produce the required strength concrete at the lowest possible cost in so far as such specifications come within the limits of the average deposits of the territory which we serve. We are not opposed to wasting materials below the ¼-in. size, but do not believe that even under the void method of proportioning it is either necessary or economical to waste material above ¼ in. in size. Tests run by us indicate that there are few deposits in the territories which we serve where the excess materials between the ¼-in. and ½-in. sizes have any material effect on the percentage of voids. We do believe, however, that not more than 5% of the coarse aggregate should be permitted to pass a ¼-in. screen."

Fire-Brick Lining of Kiln Stack Fails

THE new cement mill of the Arkansas Portland Cement Co., Okay, Ark., which commenced production the latter part of August this year, has been closed down because of the collapse of the fire-brick lining of the plant's 225-ft. reinforced-concrete kiln stack. This stack and lining was erected by the Rust Engineering Co., Pittsburgh, Penn., and had been in operation about 60 days, when the lining collapsed, without warning, on the morning of October 29. The lining was rebuilt by another chimney company, and it was expected to resume operations on November 20. It was necessary to reconstruct the lining from the base of the stack up.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Merchandising Concrete Products—Then and Now

Part I—Bertsch Brothers, Active in Advertising Block in 1921, Doing Good Business Today in Richmond, Ind.

By T. A. Day
Oak Park, Ill.

PRESENT-DAY manufacturers of concrete products have "seen the light" and many of them are merchandising their wares by means of advertising and aggressive personal selling. However, as recently as eight years ago, such methods were the exception rather than the rule. This article, the first of a series of three, is devoted to interesting facts concerning one of the "exceptions," a manufacturer who was among the first to realize the full value of advertising, aggressive personal selling and the manufacture of quality products.

'Way back in 1921 the selling methods of Bertsch Brothers, manufacturers of concrete products in Richmond, Ind., indicated that they were staunch believers in *advertising* and *service,* two of the important factors affecting *selling.* This company is in business today and is regarded as one of the leaders of the concrete products industry in the Hoosier state.

Advertising Developed the Business

"Advertising has played such a great part in the development of our business," Clarence V. Bertsch said in 1921, "that I am a thorough believer in its benefits. If every manufacturer of concrete products could realize this he would soon be on the way to increased business and increased profits."

The above statement is only one of the messages Mr. Bertsch delivered in 1921 when he was discussing the merits of advertising. To further substantiate his claim that *Advertising Plus Service Equals Business,* he related some of his personal experiences.

"Before we spent any considerable money for advertising we talked to as many men as possible who had had experience with paid publicity. The successful ones brought out two facts clearly—a product to be advertised must be of high quality and its marketing must be backed by service aimed to make its use thoroughly satisfactory.

Impressing Product and Service

"Our aim is to make a product of the highest class and to make our service so complete that after any firm or individual has once had relations with us, such an impression will have been left on this customer's mind that the next time building materials are needed, our product and service will immediately come to mind. In this way we not only advertise our products but ourselves as well.

"The manner in which the product is delivered often means much. If a certain job requires several thousand units, it is well to make certain that they can be supplied in quantities to keep masons employed every minute. A contractor does not like to have high priced labor waiting for material.

Means of Attracting Attention

"There are a number of ways in which a products manufacturer can attract the public's attention to his goods. Some of these methods cost considerable and bring little returns, yet some of the most effective advertising costs the least. One of them which we have found successful is to have displays at public gatherings. Aside from the time devoted to arranging the display and the actual cost of signs, the only important expenditure is for exhibition space. Our local Y. M. C. A. is now planning a week for a 'Made-in-Richmond Exhibit.' The purpose of this is to acquaint people with the various products manufactured in our city. We have been asked to display ours. This will be good advertising and the only cost will be a small fee to help meet the actual expense of handling the exhibit. We feel that if we had not always been active in placing our product before the public at other gatherings, we would not have been asked to exhibit at this coming Y. M. C. A. event or at other similar affairs.

"In addition to displaying different products on this occasion, we plan to have on hand a number of photographs showing some of the buildings that have been built of them. Almost everyone is interested in photographs and a good one usually takes the place of many words and in numerous

The Bertsch Brothers' concrete products plant at it appeared in 1921

cases conveys the desired message much more forcibly than if spoken or written. A prospective builder likes to see how others build and when he cannot visit all of the different structures in which he is interested, there is no better way of showing them to him than by photographs.

"Another help that will connect the manufacturer's name with his material is the displaying of signs on work where his material is being used. If practical to do so, such signs should be kept in place for a short time after the structure has been completed.

Follow Up Inquiries

"Some time ago we adopted the slogan 'Build It With Concrete Blox From Bertsch Bros. Phone 3250.' We publish this slogan

Build It with Concrete Blox from Bertsch Bros. Phone 3250

An advertising slogan adopted in 1921 and used today on all the company letterheads

in the classified section of our two daily papers every issue of the year. As a result, we get many inquiries by telephone which are followed up either by mail or personal call. Often we spend several days in personal visits with the same prospects and these are usually found quite effective. Our slogan is also printed in one or two of the local rural weeklies and, of course, appears on our trucks, stationery and all of our printed matter."

Bertsch Brothers, as has been said, are in business today. They are continuing to merchandise concrete products by advertising and aggressive personal selling. One of the manufacturers of concrete products machinery tells an interesting story about the brothers. It seems that there was a good potential market for concrete manhole and catch basin block in Richmond and vicinity. In 1928, the brothers investigated the field for this product, decided to make it and interviewed the machinery company regarding the necessary equipment. They wanted the same kind of service from the machinery company that they were in the habit of giving to their concrete products customers. The machinery factory finished the equipment quickly, but the brothers were not content to wait for delivery by freight. Instead, they sent a truck to pick up the machinery as soon as the last bolt was tightened at the factory!

(To be continued.)

Concrete Floor Hardener

THE CONCRETE floor hardening compounds marketed by the Master Builders Co., Ceveland, have been improved by the incorporation of "Omicron," a new invention, according to a booklet recently issued by that company. The new material is said to combine with the soluble constituents of portland cement concrete, thus reducing the ratios of solubles in set concrete. In addition it is claimed to produce higher compressive and tensile strength and greater resistance to concrete disintegration by acid or alkali solutions.

Failure and Success

IN THESE DAYS of strenuous competition, purchasers often express surprise that manufacturing companies, starting out confidently and apparently well financed, so soon lose their identity; but one does not have far to go to find the reasons, which may be narrowed down in a large number of cases to just two, viz.:

The company was either a simple promotional proposition, breaking into an industry that was perhaps already overcrowded, for the purpose of being bought out at a handsome profit by one of its competitors; or,

The company, under a strong promotional head, consists of men of means who are taking a flyer in a field other than their own, and, after the initial investment is made, are unwilling to further contribute financially until the time that the business may be upon a paying basis.

In the first case a sales campaign is inaugurated to provide a demand for the particular brand of material to be manufactured, and if a certain volume of business can be obtained, no matter if it may have been at a loss, the corporation then has something of value to offer to the particular competitor it may have in view, and a deal or transfer or absorption is made.

In the second case, no great sales effort is liable to be given; the business suffers from periods of spasmodic economy and liberal expenditure, and the volume of output fluctuates with each change of mood.

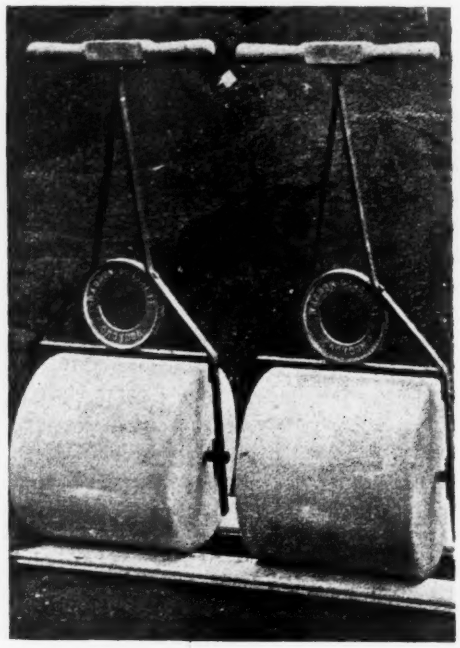
The company is in the doldrums, the plant needs expansion, but the large stockholders, who may be bankers, merchants, or professional men, knowing nothing at all about the technical side of the business, feel that their original subscription covered all that was sought by the company, and that it is now up to the operating department to make a grand success of the business and pay them their desired dividends. They somehow do not realize that the manufacturing company that would be a success must continually keep itself in a position to meet existing and growing competition. Eventually a trade combination may save them from complete financial disaster, otherwise they must make up their minds to an increase in capital expenditure to meet the contingencies of competitive business or take a substantial loss on their original investment, or more properly speaking, speculation.

In these days of "Men and Machines" there must be no letup in growth and upkeep of plant and no relaxation of sales effort if a manufacturing company wishes to maintain its place in the sun.

—W. S. Keith.

Concrete Garden Rollers

A CONCRETE garden roller is one of many different cement products made by an enterprising British manufacturer. The roller, illustrated herewith, is made to



Garden rollers are a novel concrete product

retail at about £1, with the idea of catering to the owner of a small garden who might not be tempted to buy at a higher figure. Granite aggregate is used in its construction, without any sheet steel casing. A wood mold is used for making the rollers. It should not chip unless it is subjected to ill use.—*Concrete Building* (England).

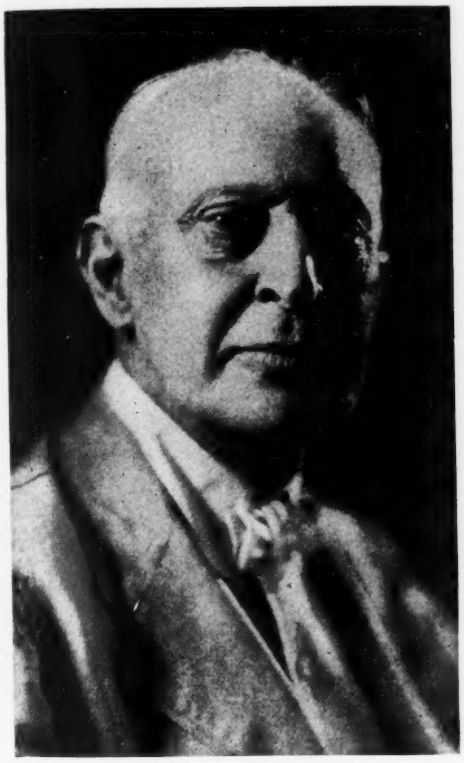
"The Pelican"—House Organ of a British Cement Manufacturer

THE OCTOBER issue of *The Pelican,* house organ of G. and T. Earle (1925), Ltd., cement manufacturers at Hull, England, is full of interesting little sketches of the company personnel. There are in the Earle company, as in large American enterprises, many officials who the average employe never gets to see, and the magazine affords the opportunity to change a man's personality from merely a name and title to something more human; the intimate biographies and pictures do just this. The organ gives also news of men and plants, some highlights on activities which are interesting to the men—all of which brings about a better company spirit.

George M. Newcomer

GEORGE M. NEWCOMER, for over 35 years identified with the cement manufacturing industry of the United States and Europe, and more recently retired as vice-president of F. L. Smidth and Co., New York, died at his home in New York on November 29 of heart failure. He was 73 years old.

Mr. Newcomer, one of the outstanding figures in the cement industry, was recognized as the first to advocate and promote the use of wet-process manufacture in the United States. His first cement connection



George M. Newcomer

was as sales agent for the Aalborg Cement Co. of Denmark. This was in 1893, and two years later he cooperated in forming the American organization of the F. L. Smidth and Co., becoming the active head of the concern until his retirement a year ago.

He was a close student of cement manufacturing processes, particularly the effects of fine grinding, and as early as 1905 contributed a valuable paper on the subject to the quarterly meeting of the American Portland Cement Manufacturers, forerunner of the present Portland Cement Association.

Federal-Aid Road Money Apportioned for Next Fiscal Year

RESPONDING TO PRESIDENT HOOVER'S SUGGESTION that public building programs be speeded up and prudently expanded to promote business and prevent unemployment, Secretary of Agriculture Arthur M. Hyde has apportioned among the 48 states and Hawaii $73,125,000 authorized by Congress as federal aid for road construction in the fiscal year 1931.

The secretary announced that the state highway departments will be authorized to proceed immediately with preparations for the expenditure of the newly apportioned funds during the next construction season.

For work during the winter, where weather conditions will permit, and in the spring and early summer throughout the country, Secretary Hyde stated there is available a balance of $28,000,000 of the federal aid funds previously apportioned, making a total of $101,125,000 with which the federal government is prepared to match at least an equal amount of state money for expenditure on federal aid roads in the calendar year 1930.

The federal fund is apportioned among all states and Hawaii in proportion to their respective areas, populations and mileages of post roads, and the share of each state is available for expenditure on roads included in the federal aid system.

The apportionment is as follows:

APPORTIONMENT OF FEDERAL AID TO THE STATES
Fiscal Year 1931

Alabama	$ 1,557,372
Arizona	1,062,190
Arkansas	1,293,086
California	2,501,170
Colorado	1,390,524
Connecticut	477,893
Delaware	365,625
Florida	921,558
Georgia	1,985,632
Idaho	932,594
Illinois	3,100,781
Indiana	1,909,505
Iowa	2,005,944
Kansas	2,048,585
Kentucky	1,414,610
Louisiana	1,040,195
Maine	675,106
Maryland	631,911
Massachusetts	1,090,022
Michigan	2,200,177
Minnesota	2,102,986
Mississippi	1,323,897
Missouri	2,382,383
Montana	1,552,865
Nebraska	1,586,526
Nevada	960,845
New Hampshire	365,625
New Jersey	936,234
New Mexico	1,190,296
New York	3,605,965
North Carolina	1,722,673
North Dakota	1,203,060
Ohio	2,753,528
Oklahoma	1,751,015
Oregon	1,197,667
Pennsylvania	3,314,707
Rhode Island	365,625
South Carolina	1,065,105
South Dakota	1,232,962
Tennessee	1,608,802
Texas	4,545,830
Utah	850,752
Vermont	365,625
Virginia	1,429,253
Washington	1,156,219
West Virginia	792,826
Wisconsin	1,849,169
Wyoming	942,455
Hawaii	365,625
	$73,125,000

Market for Building Bonds Improves

S. W. STRAUS AND CO. report bond sales throughout the country for November of $9,123,027, a gain of 13.1% compared with the same month last year. Sales for the 11 months of the year were $109,777,106, a loss of 6.9% from the corresponding period of 1928.

"These reports are significant of a pronounced change in the bond market during the last two weeks," Nicholas Roberts, president of S. W. Straus and Co., said. "The data quoted are sales made direct to the individual investors in all parts of the United States and naturally present a good cross-section of the typical American investing public.

"The figures clearly indicate that the bond business is picking up rapidly. These reports also have an important bearing on the general business situation because the public is demonstrating that it is in a mood to furnish ample capital for building construction, and active conditions in building will have a helpful effect on the general situation."

Big Gravel Plant Shipment to Russia

EIGHT carloads of gravel plant machinery consigned to the Russian Soviet Government have been shipped by the Smith Engineering Works, Milwaukee, Wis. The order was placed through the Amtorg Trading Co., the official purchasing agents for the Soviet Government. The gravel plant, when completed, will be the largest one outside of the United States. It will be placed in operation next spring and will furnish material for the construction of an 80,000-kw. hydro-electric plant near Leningrad.

This gravel plant consists of two complete and identical units, each having a washing and screening capacity of 300 cu. yd. an hour. The main washing and screening cylinders of the Telsmith "Hercules" washing screens are 72 in. in diameter by 24 ft. long, while the sand jackets are 99⅜ in. in diameter by 14 ft. in length. Each of these screens has a capacity of 300 cu. yd. per hour, and are equipped with Timken tapered roller bearings which reduce the frictional load.

This is the first gravel washing plant of any magnitude ever shipped into Russia.

Bureau of Standards Work in 1928-1929

THE ANNUAL report on the accomplishments of the National Bureau of Standards for the fiscal year ended June 30, 1929, has been released as Miscellaneous Publication No. 102. In the report the various outstanding activities are grouped according to the subjects for which Congress had made specific appropriation.

The Rock Products Market

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Asbury Park, Farmingdale, Spring Lake and Wayside, N. J.	.48	.48	1.15	1.25	1.40	....
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.25	1.15	1.75	....	1.75	1.75
Buffalo, N. Y.	1.00	1.05	1.05	....	....	....
Erie, Penn.	.60	.85	....	1.30	1.30	1.30
Leeds Jct. and Scarboro, Me.	....	....	1.75	....	1.25	1.00
Milton, N. H.	....	....	1.75	....	1.25	1.00
Montoursville, Penn.	1.00	.60	.50	.40	.40	.40
Northern New Jersey	.50	.50	1.25	1.25	1.25	....
South Portland, Me.	....	1.00	2.25	....	....	2.00
Washington, D. C.	.55	.55	1.20	1.20	1.20	1.00
Georgetown, D. C.	.55	.55	1.20	1.20	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.35	.20	.20	.40	.40	.40
Appleton, Minn.	....	.50	1.25	....	1.50	....
Attica, Ind.			All sizes .75–.85			
Barton, Wis.	....	.40d	.50d	.65d	.65d	.65d
Des Moines, Iowa	.60	.60	1.50	1.50	1.50	1.50
Dresden, Ohio	....	.60– .70	....	.70– .80	.70– .80	....
Eau Claire, Wis.	....	.55	.70	1.00	1.00	....
Elkhart Lake and Glenbeulah, Wis.	.50	.35	.50	.60	.50	.50
Grand Rapids, Mich.	....	.50	.60	.70	.70	.70
Hamilton, Ohio	.90-1.20	.90–1.20	.90–1.20	.90..1.20	.90–1.20	.90–1.20
Hersey, Mich.	....	.50	....	.70	.70	.70
Indianapolis, Ind.	.50– .75	.40– .60	.50– .75	.50– .75	.60– .85	.60– .85
Mankato, Minn. (b)	.55	.45	1.25	1.25	1.25	....
Mason City, Iowa	.50	.50	.85	1.25	1.25	1.25
Milwaukee, Wis.	.91	.91	1.06	1.06	1.06	1.06
Minneapolis, Minn. (a)	.35	.35	1.35	1.35	1.35	1.25
St. Paul, Minn. (e)	.45	.35	.75	1.25	1.25	1.25
Terre Haute, Ind.	.75	.60	.75	.75	.75	.75
Waukesha, Wis.	....	.45	.55	.55	.60	.60
Winona, Minn.	.40	.40	.50	1.10	1.10	1.25
SOUTHERN:						
Brewster, Fla.	.40	.40	....	....	....	....
Charleston, W. Va.	.75	1.25	1.25	1.25	1.25	1.25
Eustis, Fla.	....	.40– .50	....	....	....	....
Ft. Worth, Texas	.75	.75	.90	1.00	1.10	1.10
Gainesville, Texas	....	....	....	....	.55	....
Knoxville, Tenn.	1.00	1.00	1.20	1.20	1.20	....
Roseland, La.	.30	.30	1.00	.80	.80	.80
WESTERN:						
Los Angeles, Calif.	.10– .40	.10– .40	.20– .90	.50– .90	.50– .90	.50– .90
Oregon City, Ore.		All grades range from 1.00 to 1.50 per cu. yd.				
Phoenix, Ariz. (c)	1.25*	1.15*	1.50*	1.15*	1.15*	1.00*
Pueblo, Colo.	.80	.60	....	1.20	....	1.15
Seattle, Wash.	1.25*	1.25*	1.25*	1.25*	1.25*	1.25*

*Cubic yd. ‡Delivered on job by truck. (a) Per yd., delivered by truck, ¼-in. down, 1.25; 2-in. and less, 2.40. (b) ¼- to ¾-in., 1.25. (c) 60-70% crusher boulders. (d) Plus 15c for winter loading. (e) Prices f.o.b. cars N. P. Ry.

Core and Foundry Sands

Silica sand quoted washed, dried, screened unless otherwise stated; per ton f.o.b. plant.

City or shipping point	Molding, fine	Molding, coarse	Molding brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.75	2.75	2.75	....	....	3.75	....
Cheshire, Mass.		Sand for soap, 7.00–8.00				6.00–8.00	....
Dresden, Ohio	1.50–1.75	1.25–1.50	1.50	....	1.50	....	....
Eau Claire, Wis.	....	....	....	....	....	2.50–3.00	....
Elco, Ill.		Water floated silica, 92-99½% thru 325 mesh, 18.00–40.00 per ton					
Franklin, Penn.	....	1.75	....	1.75	....	....	....
Kasota, Minn.	....	....	....	....	....	....	1.00
Montoursville, Penn.	....	....	....	1.35–1.60	....	....	....
New Lexington, Ohio	1.75–2.00	1.25	....	....	....	....	....
Ohlton, Ohio	1.75	1.75	....	2.00	1.75	1.75	....
Ottawa, Ill.	1.25	1.25	1.25	1.25	1.25	3.50	3.00
Red Wing, Minn. (a)	....	....	....	....	1.50	3.00	1.50
San Francisco, Calif.[1]	3.50†	5.00†	3.50†	3.50–5.00†	3.50–5.00†	3.50–5.00†	....
Silica, Mendota, Va.			Potters' flint, 8.00–14.00				

†Fresh water washed, steam dried. [1]Core, washed and dried, 2.50. (a) Filter sand. 3.00.

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Beach City, Ohio	....	1.50
Eau Claire, Wis.	4.30	.60–1.00
Franklin, Penn.	....	1.75
Ohlton, Ohio	1.75	1.75
Ottawa, Ill.	3.25	1.25
Red Wing, Minn.	....	1.00
San Francisco, Calif.	3.50	3.50
Silica, Va.	....	1.75

Glass Sand

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton f.o.b. plant.

Cheshire, Mass., in carload lots	5.00–7.00
Franklin, Penn.	2.25
Klondike, Mo.	2.00
Ohlton, Ohio	2.50
Ottawa, Ill.	1.25
Red Wing, Minn.	1.50
San Francisco, Calif.	4.00–5.00
Silica and Mendota, Va.	2.50–3.00

Bank Run Sand and Gravel

Prices given are per ton, f.o.b. producing plant or nearest shipping point.

Algonquin, Ill.¶ (2-in. and less)	.30
Appleton, Minn.†	.55
Burnside, Conn.†	.75*
Chicago, Ill.†	.92–1.20
Des Moines, Ia.¶ (1-in. and less)	.85
Fort Worth, Tex.¶ (2-in. and less)	.60
Gainesville, Tex.¶ (1½-in. and less)	.55
Gary and Miller, Ind.†	1.15–1.40a
Grand Rapids, Mich.¶ (1-in. and less)	.50
Hamilton, Ohio¶ (1½-in. and less)	.50–1.00
Hersey, Mich.¶ (1-in. and less)	.50
Mankato, Minn.†	.70
Seattle, Wash.—Sand, 1/10-in. down, .25*; ¼-in. and less, same; gravel in sizes ranging from 2-in. and less to ½-in. and less	.25*
Winona, Minn.¶ (2-in. and less)	.60
York, Penn. Sand, ¼-in. and less, 1.00; 1/10-in. down	1.10

*Cubic yard. †Fine sand, 1/-10-in. down. (a) Cu. yd., delivered Chicago. ¶Gravel.

Current Price Quotations

ROCK PRODUCTS solicits volunteers to furnish accurate price quotations.

Portland Cement

	Per Bag	Per Bbl.	High Early Strength
Albuquerque, N. M.	.91¼	‡3.15	4.30¶
Atlanta, Ga. (1) (2)	....	2.11	3.01¶
Baltimore, Md. (1)	....	2.65	3.56¶
Berkeley, Calif.	....	‡2.24	......
Birm., Ala. (1) (2)	....	1.75	2.73¶
Boston, Mass.	.44½	‡1.78–1.88	3.27¶
Buffalo, N. Y. (1)	.48¾	2.45	3.35¶
Butte, Mont.	.90¼	3.61	......
Cedar Rapids, Ia.	....	2.04	2.99f
Centerville, Calif.	....	‡2.24	......
Charleston, S. C. (2)	....	2.40b	3.15¶
Cheyenne, Wyo. (1) (2)	.71½	2.86	......
Chicago, Ill.	....	1.85	3.15¶
Cincinnati, Ohio	....	1.72–1.92	3.22¶
Cleveland, Ohio	....	1.94	3.24¶
Columbus, Ohio	....	1.72	3.22¶
Dallas, Texas	....	‡1.80	3.14¶
Davenport, Iowa	....	2.04	......
Dayton, Ohio	....	1.74	3.24¶
Denver, Colo. (1) (2)	.76¼	3.05	......
Des Moines, Iowa	....	2.14	2.99f
Detroit, Mich.	....	1.95	3.25¶
Duluth, Minn.	....	1.84	......
Fresno, Calif.	....	‡2.43	......
Houston, Texas	....	‡1.90	3.38¶
Indianapolis, Ind.	.54¾	1.29–1.69	f2.44-3.19¶
Jack., Miss. (1) (2)	....	2.19	3.09¶
Jacksonville, Fla. (1) (2)	....	2.36	3.26¶
Jersey City, N.J. (1)	....	2.53	3.43¶
Kansas City, Mo. (1) (2)	.45½	2.32	f2.87–3.22¶
Los Angeles, Calif.	.37½	1.50	......
Louisville, Ky.	.55½	1.72	f2.92–3.22¶
Memphis, T'n. (1) (2)	....	2.19	f2.74–3.09¶
Merced, Calif.	....	‡2.11	......
Milwaukee, Wis.	....	2.00	3.30
Minneapolis, Minn.	....	2.02	......
Montreal, Que.	....	1.60	......
New Orleans, La.	.43	1.72	2.87¶
New York, N.Y. (1)	.43¼	2.43	3.33¶
Norfolk, Va.	....	1.77	3.27¶
Oklahoma City, Okla.	.57¼	‡2.16	3.31¶
Omaha, Neb. (1) (2)	.54	2.51	3.41¶
Peoria, Ill.	....	2.02	......
Pittsburgh, Pa. (1)	....	2.25	3.35¶
Philadelphia, Pa. (1)	....	2.55	3.45¶
Phoenix, Ariz.	....	3.51	......
Portland, Ore.	....	2.30	......
Reno, Nev. (2)	....	2.82	......
Richmond, Va. (1)	....	2.74	3.40¶
Sacramento, Calif.	....	‡2.35	......
Salt Lake City, Utah	.70¼	2.81	......
San Antonio, Texas	....	......	3.42¶
San Francisco (1) (2)	....	2.60	......
Santa Cruz, Calif.	....	‡2.20	......
Savannah, Ga. (2)	....	2.36a	3.15¶
St. Louis, Mo.	48¾	1.50–1.70	f2.65–3.00¶
St. Paul, Minn.	....	2.02	......
Seattle, Wash.	....	2.40	f3.70
Tampa, Fla. (1) (2)	....	2.40	3.30¶
Toledo, Ohio	....	1.83–2.03	3.33¶
Topeka, Kan. (1) (2)	.50¼	2.51	3.41¶
Tulsa, Okla. (1) (2)	.53¼	2.53	3.43¶
Wheeling, W.Va. (1)	....	2.32	3.42
Winston-Salem, N. C.	....	1.84	3.34¶

Mill prices f.o.b. in carload lots, without bags, to contractors.

	Per Bag	Per Bbl.	High Early Strength
Albany, N. Y.	....	2.15	......
Bellingham, Wash.	....	2.35†	......
Buffington, Ind.	....	1.60	......
Chattanooga, Tenn.	....	2.05	......
Concrete, Wash.	....	2.25	......
Davenport, Calif.	....	2.05	......
Hannibal, Mo.	....	1.90	......
Hudson, N. Y.	....	1.75	......
Leeds, Ala.	....	1.65	......
Lime & Oswego, Ore.	....	2.40	......
Mildred, Kan.	....	2.35	......
Nazareth, Penn.	....	2.15	......
Northampton, Penn.	....	1.75	......
Richard City, Tenn.	....	2.05	......
Steelton, Minn.	....	1.65	......
Toledo, Ohio	....	2.20	......
Universal, Penn.	....	1.60	......

NOTE—Add 40c per bbl. for bags. †10c disc., 10 days. ‡10c disc., 15 days. (a) With bags, 11c refund for paid freight bill. (b) With bags, 15c bbl. refund for paid freight bill. (1) Includes cloth bags at 40c. (2) 10c cash disc., 10c dealer discount. (f) "Velo" cement, including cost of paper bag, 10c disc. 10 days. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c disc. 15 days.

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., at producing point or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.30	1.30	1.30	1.30	1.30	1.30
Chazy, N. Y.	....	1.60	....	....	....	....
Dundas, Ont.	.53	1.05	1.05	.90	.90	.90
Farmington, Conn.	....	1.30	1.10	1.00	1.00	....
Ft. Spring, W. Va.	.35	1.35	1.25	1.15	1.10	1.00
Munns, N. Y.	.75	1.15	1.15	1.00	1.00	....
Prospect Jct., N. Y.	.80	1.15u	1.15u	1.15u	1.10v	....
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
Shaw's Junction, Penn. (e)	.85	1.35–1.60	1.35	1.35	1.35	1.35
Syracuse, N. Y.	.50	1.00	1.00	1.00	1.00	1.00
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill.	1.85	....	1.85	....	....	....
Davenport, Iowa	1.00	1.50	1.50	1.30	1.30	1.30
Dubuque, Iowa	.95	.95	.95	.95	.95	.95
Stolle and Falling Springs, Ill.	1.05–1.70	.95–1.70	1.15–1.70	1.05–1.70	1.05–1.70	....
Greencastle, Ind.	1.25	1.10	1.10	1.10	1.00	1.00
Lannon, Wis.	.90	1.00	1.00	.90	.90	.90
McCook, Ill.	.90	1.00	1.00	1.00	1.00	1.00
Montreal, Canada	.75–1.00	1.65–1.85	1.45	1.15	1.05	.95
Sheboygan, Wis.	1.20	1.20	1.20	1.20	....	....
Stone City, Iowa	.75	....	1.10	1.05	1.10	....
Toronto, Canada	2.50	2.50	2.50	2.50	2.50	2.50
Waukesha, Wis.	....	.90	.90	.90	.90	.90
Wisconsin points	.50	....	1.00	.90	.90	....
Youngstown, Ohio	1.00	1.00	1.25	1.25	1.25	1.25
SOUTHERN:						
Cartersville, Ga.	1.00	1.65	1.65	1.35	1.15	1.15
Chico, Texas (a)	.50	1.30	1.30	1.25	1.20	1.00
Cutler, Fla.	....	....	1.75r	1.75r	....	....
El Paso, Texas (r)	.50–1.00	1.25–1.75	1.25–1.75	1.00–1.60	1.00–1.60	....
Olive Hill, Ky.	....	1.00	1.00	.90	.90	.90
Rocky Point, Va.	.50– .75	1.40–1.60	1.30–1.40	1.15–1.25	1.10–1.20	1.00–1.05
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.70
Blue Springs and Wymore, Neb. (t)	.25	1.45	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.10	1.25	1.25	1.25	1.00	....
Richmond, Calif.	.75	....	1.00	1.00	1.00	....
Rock Hill, St. Louis, Mo.	1.45	1.45	1.45	1.45	1.45	1.45
Stringtown, Okla. (a)	.50	1.30	1.30	1.25	1.20	1.00

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn. (q)	1.20	1.60	1.45	1.35	....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	....
Chico, Texas	2.50	2.00	1.45	1.20	1.15	....
Duluth, Minn.	.90–1.25	2.25–2.75	1.55	1.55	1.55	1.25
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Knippa, Texas	2.50	2.00	1.45	1.25	1.20	1.00
New Britain, Plainville, Rocky Hill, Wallingford, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	....
Northern New Jersey	1.35	2.10	1.90	1.50	1.50	....
Richmond, Calif.	.75	....	1.00	1.00	1.00	....
Toronto, Canada	4.70	5.80	....	4.05	....	....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Cayce, S. C.—Granite	....	....	1.75	1.75	1.60	....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Emathla, Fla.—Flint rock	....	....	2.25–2.50s	....	....	....
Lithonia, Ga.—Granite	.50	1.75b	1.60	1.35	1.25	....
Lohrville, Wis.—Granite	1.65	1.70	1.65	1.45	1.50	....
Middlebrook, Mo.	3.00–3.50	....	2.00–2.25	2.00–2.25	....	1.25–3.00
Richmond, Calif.—Quartzite	.75	....	1.00	1.00	1.00	....
Toccoa, Ga.—Granite	.50	1.50	1.50	1.25	1.25	1.20

(a) Limestone, ¼ to ⅜ in., 1.35 per ton; Lime flour, 8.50 per ton. (b) To ⅛ in. (c) 1 in., 1.40. (d) 2-in., 1.30. (e) Price net after 10c cash discount deducted. (n) Ballast R.R., .90; run of crusher, 1.00. (q) Cusher run, 1.40; ¼-in. granlithic finish, 3.00. (r) Cubic yard. (s) 1-in. and less, per cubic yard. (t) Rip rap, 1.20–1.40 per ton. (u) Less 2%, 15 days. (v) Less 2%, 10 days.

Crushed Slag

City or shipping point	Roofing	¼ in. down	½ in. and less	¾ in. and less	1½ in. and less	2½ in. and less	3 in. and larger
EASTERN:							
Allentown, Penn.	1.00–1.50	.40– .60	.80–1.00	.50– .80	.50– .80	.60– .80	.80
Buffalo, N. Y., Erie and Du Bois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Eastern Pennsylvania	2.00–2.50	.90–1.20	1.00–1.50	1.00–1.20	1.00–1.20	1.00–1.20	1.00–1.20
Northern New Jersey	2.00–2.50	.90–1.20	1.00–1.50	1.00–1.20	1.00–1.20	1.00–1.20	1.00–1.20
Reading, Penn.	2.00	1.00	....	1.00	....	....	....
Western Pennsylvania	2.00–2.50	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	2.05*	1.30*	1.80*	1.45*	1.45*	1.45*	....
Jackson, Ohio	2.05*	1.05*	1.80*	1.30*	1.05*	1.30*	....
Toledo, Ohio	1.50	1.10	1.25	1.25	1.25	1.25	1.25
SOUTHERN:							
Ashland, Ky.	2.05*	1.45*	1.80*	1.45*	1.45*	1.45*	....
Ensley and Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.80
Longdale, Roanoke, Ruesens, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05	.55*	....	1.15*	.90*	.90*	....

5c per ton discount on terms. †1¼ in. to ¼ in., $1.05; ⅜ in. to 10 mesh, $1.25*; ⅜ in. to 0 in., .90*; ¼ in. to 10 mesh, .80*.

Agricultural Limestone

(Pulverized)

Alton, Ill.—Analysis, 99% $CaCO_3$; .03% $MgCO_3$; 90% thru 100 mesh	2.95
Belfast, Me.—Analysis, $CaCO_3$, 90.4%; $MgCO_3$, trace, per ton	7.00
Branchton, Penn.—100% thru 20 mesh, 60% thru 100 mesh, 45% thru 200 mesh	a5.00
Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 90% thru 50 mesh	1.50
Cartersville, Ga.—90% thru 100 mesh, 2.00; 50% thru 50 mesh	1.50
Davenport, Iowa—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, per ton	6.00
Joliet, Ill.—Analysis, 52% $CaCO_3$; 48% $MgCO_3$; 90% thru 100 mesh	3.50
Knoxville, Tenn.—Analysis, 52% $CaCO_3$; 36% $MgCO_3$; 80% thru 100 mesh, bags, 3.75; bulk	2.50
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Marlbrook, Va.—Precipitated Lime) Analysis, 92% $CaCO_3$; 2% $MgCO_3$, 50% thru 50 mesh; bulk, 2.25; bags	4.50
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh	4.25
Olive Hill, Ky.—Analysis, $CaCO_3$ 94-98%; 90% thru 4 mesh	1.00
Sibley, Mich.—Analysis, 87.47% $CaCO_3$; 8.30% $MgCO_3$; 60% thru 100 mesh, bulk, per ton, 2.30; 100-lb. paper bags, f.o.b. Sibley, Mich., per ton	3.75

(a) Less 50c comm. to dealers per ton.

Agricultural Limestone

(Crushed)

Bedford, Ind.—Analysis, 98½% $CaCO_3$; ½% $MgCO_3$; 90% thru 10 mesh	1.50
Chico and Bridgeport, Tex. — Analysis, 95% $CaCO_3$; 1.3% $MgCO_3$; 90% thru 4 mesh	1.00–1.25
Charles-Town, W. Va.—Lime Marl—Analysis, 95% $CaCO_3$, 50% thru 100 mesh, bulk, 3.00; including burlap bags	4.50
Colton, Calif.—100% thru 14 mesh, bulk	3.50
Davenport, Iowa—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 4 mesh, 50% thru 20 mesh; bulk, per ton	1.10
Dubuque, Ia.—Analysis, 34.96% $CaCO_3$; 59.62% $MgCO_3$; 90% thru 4 mesh	.95
Dundas, Ont.—Analysis, 54% $CaCO_3$; $MgCO_3$, 43%; 50% thru 50 mesh	1.00
Fort Spring, W. Va.—Analysis, 40% $CaCO_3$; 3% $MgCO_3$; 50% thru 100 mesh	1.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$; 75% thru 100 mesh, sacked	5.00
Jamesville, N. Y.—Analysis, 90% $CaCO_3$; 5% $MgCO_3$; 90% thru 100 mesh; in sacks, 4.60; bulk	3.35
Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼ in. to dust)	1.00
Marblehead, Ohio—90% thru 100 mesh	3.00
90% thru 50 mesh	2.00
90% thru 4 mesh	1.00
McCook and Gary, Ill.—Analysis, 60% $CaCO_3$, 40% $MgCO_3$; 90% thru 4 mesh	.90
Middlepoint, Bellevue, Bloomville, Kenton and Whitehouse, Ohio; Monroe, Mich.; Bluffton, Greencastle and Kokomo, Ind. —85% thru 10 mesh, 25% thru 100 mesh	1.50
Rocky Point, Va.—50% thru 200 mesh, bulk, in carloads, 2.00; 100-lb. paper bags, 3.25; 200-lb. burlap bags	3.50
Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh	1.15–1.70
Stone City, Iowa — Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
West Stockbridge, Mass.* — Analysis, 95% $CaCO_3$; 90% thru 100 mesh, bulk	3.50
100-lb. paper bags, 4.75; cloth	5.25
Waukesha, Wis.—90% thru 100 mesh, 4.00; 50% thru 100 mesh	2.10

*Less 25c cash 15 days.

Pulverized Limestone for Coal Operators

Davenport, Iowa—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, ton	6.00
Hillsville, Penn., sacks, 5.10; bulk	3.50
Joliet, Ill.—Analysis, 50% $CaCO_3$; 42% $MgCO_3$; 98% thru 100 mesh; 90% thru 200 mesh (bags extra)	3.50
bulk	4.00
Piqua, Ohio—99% thru 100 mesh, bulk, 3.50; in 80-lb. bags (f.o.b. Piqua)	5.00
Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk	2.25–3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.00

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Blk.	Ground burnt lime, Bags	Lump lime, Blk.	Lump lime, Bbl.
EASTERN:								
Berkeley, R. I.	....	....	12.00	....	....	17.50	....	2.00
Buffalo, N. Y.	....	....	....	12.00	....	....	....	....
Knickerbocker, Devault, Cedar Hollow and Rambo, Penn.	....	9.50	9.50	9.50	....	9.50	8.50	....
Lime Ridge, Penn.	9.00	9.00	9.00	....	7.00	....	5.00	....
CENTRAL:								
Afton, Mich.	....	....	....	....	....	10.75	7.50	12.11
Carey, Ohio	9.50	6.50	6.50	....	8.00	....	8.00	1.50
Cold Springs, Ohio	....	6.50	6.50	....	....	....	7.00	....
Gibsonburg, Ohio	9.50	....	....	....	7.00	9.00	7.00	....
Huntington, Ind.	....	6.50	6.50	....	....	....	....	....
Little Rock, Ark.	....	14.40	....	15.40	....	....	11.90	1.79
Marblehead, Ohio	....	6.50	6.50	....	....	....	7.00	1.50[8]
Milltown, Ind.	....	7.50– 8.50	....	8.25– 9.25	7.00[5]	9.25[6]	6.50[7]	1.40[8]
Scioto, Ohio	10.50	7.50	7.50	8.50	8.25	.62½	7.00	1.50
Sheboygan, Wis.	....	10.50	10.50	10.50	....	....	9.50	2.00[4]
Tiffin, Ohio	....	....	....	....	8.00	10.00	....	....
Wisconsin points	....	11.50	....	....	....	....	9.50	....
Woodville, Ohio[26]	9.50	6.50	6.50	10.50[24]	7.00	9.00[9]	8.00	1.40[3]
SOUTHERN:								
Keystone, Ala.	17.00	9.00	9.00	8.00–12.00	....	....	6.00[21]	1.35
Knoxville, Tenn.	....	9.00	9.00	7.50– 9.00	6.00	1.35[10]	6.00	1.50
Ocala, Fla.	....	11.00	....	....	....	....	....	1.45
Pine Hill, Ky.	....	9.00	7.50	7.50	....	....	5.00[1]	1.25[2]
WESTERN:								
Kirtland, N. M.	....	....	....	....	....	....	15.00	....
Los Angeles, Calif.	....	....	....	....	....	....	12.00	....
San Francisco, Calif.	19.00	14.00–17.00	12.50	14.00–19.00	14.50[20]	.90[17]	11.00[19]	1.85[17]

[1]Also 6.00. [2]To 1.35. [3]Wooden, steel, 1.60. [4]Steel. [5]To 7.50. [6]To 9.75. [7]To 7.00. [8]To 1.50 in steel drums; 1.25 and 1.35 in waterproof bags. [9]80-lb. [10]Per bbl. [17]Less credit for return of empties. [19]To 14.50. [20]Also 13.00. [21]To 8.00. [24]Superfine, 99.25% thru 200 mesh. [26]General purpose hydrated lime in 10-lb. paper sacks, 12.50 per ton.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 100% thru 200 mesh, 6.00 per ton in paper bags; 94% thru 300 mesh, 6.00 per ton in paper bags.

Slate Granules

Esmont, Va.—Blue, $7.50 per ton. Granville, N. Y.—Red, green and black, **$7.50** per ton.
Pen Argyl, Penn.—Blue-grey, 6.50 per ton in 150-lb. paper bags (plus 10c per bag).

Roofing Slate

Prices per square—Standard thickness.

City or shipping point:	3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Arvonia, Va.—Buckingham oxford grey	13.88	19.44	24.99	29.44	34.44	45.55
Bangor, Penn.—No. 1 clear	10.50–14.50	24.50	29.00	33.50	44.50	55.60
No. 1 ribbon	9.00–10.25	20.00	24.50	29.00	40.00	51.25
Sea Green No. 1	10.00–14.00	20.00	25.00	30.00	40.00	50.00
Mottled Purple	14.75–19.00	24.00	30.00	36.00	48.00	60.00
No. 1 Albion clear	9.00–10.50	16.00	23.00	27.00	37.00	46.00
Chapman Quarries, Penn.—No. 1	8.50–11.25		(Vari-tone, 12.00–13.00)			
Medium	7.75– 9.00	....	....	....	....	....
Hard vein	....	16.00	23.00	26.00	32.00	40.00
Granville, N. Y.—Sea green, weathering	**14.00**	**24.00**	**30.00**	**36.00**	**48.00**	**60.00**
Semi-weathering, green and gray	**15.40**	**24.00**	**30.00**	**36.00**	**48.00**	**60.00**
Mottled purple and unfading green	**21.00**	**24.00**	**30.00**	**36.00**	**48.00**	**60.00**
Red	**27.50**	**33.50**	**40.00**	**47.50**	**62.50**	**77.50**
Monson, Maine	**19.80**	**24.00**	....	....	....	....
Pen Argyl, Penn.*						
Graduated slate (blue)	....	16.00	23.00	27.00	37.00	46.00
Graduated slate (grey)	....	18.00	25.00	29.00	39.00	48.00
Color-tone	11.50–12.50; Vari-tone, 12.00–13.00; Cathedral gray, 14.00–15.00					
No. 1 clear (smooth text)	7.25–10.50; No. 1 clear (rough text), 8.25–9.50					
Albion-Bangor medium	8 00–9.00; No. 2 clear, 8.00–9.00; No. 1 ribbon, 8.00–8.50					
Slatedale and Slatington, Penn.—						
Genuine Franklin	11.25	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1	10.50	22.00	26.00	30.00	40.00	50.00
Blue Mountain No. 1 clear	9.50	18.00	22.00	26.00	36.00	46.00
Blue Mountain No. 2 clear	8.00	18.00	22.00	26.00	36.00	46.00

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from **50c** to **$1.25** per square.
*Unfading grey, 14.00–15.00; 10% disc. to roofer; 10%–8⅓% to wholesaler.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:
Crude talc, per ton 5.00
Ground talc (20-50 mesh), bags 6.50
Ground talc (150-200 mesh), bags 9.00
Pencils and steel crayons, gross 1.50– 2.00

Chester, Vt.:
Ground talc (150-200 mesh), paper or burlap bags, bags extra 7.50– 8.50
Same, including 50-lb. Kraft paper bags 8.50– 9.50

Clifton, Va.:
Crude talc, per ton 4.00
Ground talc (150-200 mesh), in bags 12.00

Conowingo, Md.:
Crude talc, bulk 4.00
Ground talc (150-200 mesh), in bags 14.00
Cubes, blanks, per lb. .... .10

Emeryville, N. Y.:
Ground talc (200 mesh), bags 13.75
Ground talc (325 mesh), bags 14.75

Hailesboro, N. Y.:
Ground talc (300-350 mesh) in 200-lb. bags 15.50–20.00

Henry, Va.:
Crude (mine run) 3.50– 4.50
Ground talc (150-200 mesh), bags 8.75–14.00

Joliet, Ill.:
Ground talc (200 mesh) in bags:
California white 30.00
Southern white 20.00
Illinois talc 10.00
Crude talc 3.75

Los Angeles, Calif.:
Ground talc (150-200 mesh) in bags 16.00–25.00

Natural Bridge, N. Y.:
Ground talc (300-325 mesh), bags 12.00–15.00

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Gordonsburg, Tenn.—B.P.L. 65-68% 3.75– 4.25
Mt. Pleasant, Tenn.—B.P.L., 75% 6.50
Run of plant fines, 72% B.P.L., per ton of 2000 lb. 5.00

Ground Rock

(2000 lb.)

Gordonsburg, Tenn.—B.P.L. 65–70% 3.75– 4.25
Mt. Pleasant, Tenn.—Lime phosphate: B.P.L., 72½% 11.20
Mt. Pleasant, Tenn.—B.P.L., 72% 5.00– 5.50

Florida Phosphate

(Raw Land Pebble)

(Per Ton)

Florida—F.o.b. mines, gross ton, 68/66% B.P.L., Basis 68% 3.25
70% min. B.P.L., Basis 70% 3.75

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Pringle, S. D.—Mine run, per ton 100.00–125.00
Punch mica, per lb. .... .06
Scrap, per ton, carloads 20.00

Rumney Depot, N. H.—Per ton,
Mine run 300.00–360.00
Clean shop scrap 27.50–29.00
Mine scrap 22.50
Roofing mica a37.50–40.00
Punch mica, per ton 200.00–240.00
Trimmed mica, per ton, 40 mesh, 42.50–45.00; 100 mesh, 60.00; 200 mesh 100.00

Trenton, N. J.—Mine scrap, per ton 20.00
Clean shop scrap, per ton 22.00
(a) Also 38.00–42.50 per ton.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

	Crushed Rock	Ground Gypsum	Agri-cultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	—Plaster Board— ⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft
Acme, Tex.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Blue Rapids, Kan.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Centerville, Iowa	....	....	6.00	7.00	....	7.50	8.50	10.50a	....	....	....	....	....
East St. Louis, Ill.—Special	Gypsum Products—Partition section, 4 in. thick, 12 in. wide, and up to 10 ft. 3 in. long, 12c per ft., 21.00 per ton; outside wall section and interior bearing wall section, 6 in. wide, 6 in. thick, and up to 10 ft. 3 in. long, 25c per ft., 30.00 per ton; floor section, 7 in. thick, 16 in. wide, and up to 13 ft. 3 in. long, 17c per ft., 23.00 per ton.												
Ft. Dodge, Iowa; N. Holston, Va.; Akron, N. Y.	1.50–3.00	4.00	4.00	4.00–6.00	4.00–6.00	4.00–6.00	10.00	10.00	19.00	19.00	10.50	10.50	12.00
Grand Rapids, Mich.	....	....	7.00d	....	8.00d	8.00d	19.85c	8.00d	29.25e	21.00d	....	15.00	22.50
Los Angeles, Calif. (b)	....	....	7.00–9.50	7.00–9.50	10.00-12.00	....	10.00–12.00	....	....	....	....	....	....
Medicine Lodge, Kan.	1.40	....	....	....	....	....	....	....	15.00y	....	....	....	....
Portland, Colo.	....	7.00	7.00	9.00	9.00	9.50	9.00	....	27.50	....	22.50	27.50	....
Providence, R. I. (x)	....	....	....	12.00–13.00e	....	....	....	....	....	....	....	....	....
Seattle, Wash. (z)	6.00	9.00	9.00	13.00	....	....	14.00	....	....	....	....	....	....
Winnipeg, Man.	5.00	....	7.00	13.00	14.00	14.00	....	....	....	....	20.00w	25.00g	33.00f

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) White molding. (b) Plasterboard, ⅜-in., 16c-17c sq. yd. (c) Satin Spar, in paper bags. (d) Includes paper bags. (e) Includes jute sacks. (f) "Gyproc," ⅜ in. by 48 in. by 5 and 10 ft. long. (g) ⅜ in. by 48 in. by 3 to 4 ft. (w) 16x48. (x) "Fabricaste" gypsum blocks, 2- and 3-in., f.o.b. motor trucks at plants, 7¼c-8¼c. Block setting plaster, per ton, in jute sacks, 12.00. (y) Jute sacks, 18.00; paper sacks, 16.00. (z) Gypsum partition tile, 3-in., 9c per sq. ft.; 4-in., 11c per sq. ft.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream and coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Cranberry Creek, N. Y.—Bio-Spar, per ton in bags in carload lots, 9.00; less than carload lots, 12.00 per ton in bags; bulk, per ton	....	7.50
Crown Point, N. Y.—Mica Spar	....	¶9.00–‖12.00
Davenport, Iowa — White limestone, in bags, per ton	‖6.00	‖6.00
Easton, Penn.— Royal green	16.00–20.00a	....
Harrisonburg, Va.	11.00–14.50	....
Middlebrook, Mo.—Red	....	20.00–25.00
Middlebury, Vt. — Middlebury white	....	‖9.00–a10.00
Middlebury and Brandon, Vt.—Caststone, per ton, including bags	....	c5.50
Phillipsburg, N. J.—Royal green granite	....	15.00–18.00
Randville, Mich.—Crystalite white marble, bulk	4.00	4.00– 7.00
Stockton, Calif.—"Nat-rock" roofing grits	....	12.00–20.00
Tuckahoe, N. Y.—Tuckahoe white	8.00	....
Warren, N. H.	....	7.90– 9.50

¶C.L. ‖L.C.L. (a) Including bags. (b) In burlap bags, 2.00 per ton extra. *Per 100 lb. (c) Per ton f.o.b. quarry in carloads; 7.00 per ton L.C.L.

Soda Feldspar

DeKalb Jct., N. Y.—Color, white; pulverized, 200 mesh, in bags, per ton, 20.00, bulk 18.00; 140 mesh, in bags, ton, 18.00; bulk 16.00

Potash Feldspar

Auburn and Topsham, Me.—Color white, 98% thru 140 mesh (bulk) 19.00

Bedford Hills, N. Y.—Color, white; analysis, K_2O, 12.26%; Na_2O, 2.86%; SiO_2, 66.05%; Fe_2O_3, .08%; Al_2O_3, 18.89%; pulverized 78% thru 100 mesh, bulk, 11.00–14.00; crude, bulk, per ton 9.00

Coatesville, Penn.—Color, white; analysis, K_2O, 12.30%; Na_2O, 2.86% SiO_2, 66.05%; Fe_2O_3, .08%; Al_2O_3, 18.89%; crude, per ton 8.00

Trenton, N. J.—White; analysis, K_2O, 13-14%; Na_2O, 2-2½%; SiO_2, 64-65%; Fe_2O_3, 0.07%; Al_2O_3, 18.50-19.25%; pulverized, 97% thru 325 mesh, crude, 8.50 per ton, ground 21.00

Rumney and Cardigan, N. H.—Color, white: analysis, K_2O, 9-12%; Na_2O, trace; SiO_2, 64-67%; Al_2O_3, 17-18%, crude, bulk 7.00– 7.50

Rumney Depot, N. H.—Color, white; analysis, K_2O, 8-13%; Na_2O, 1-1½%; SiO_2, 62-68%; Al_2O_3, 17-18%, crude, bulk 7.00– 7.50

Penland, N. C.—White; crude, bulk **8.00**

Ground, bulk **16.50**

Spruce Pine, N. C.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 68%; Fe_2O_3, 0.10%; Al_2O_3, 18%; 99½% thru 200 mesh; pulverized, bulk 18.00

(Bags 15c extra.)

Cement Drain Tile

Graettinger, Iowa.—Drain tile, per foot: 5-in., .04½; 6-in., .05½; 8-in., .09; 10-in., .12½; 12-in., .17½; 15-in., .35; 18-in., .50; 20-in., .60; 24-in., 1.00; 30-in., 1.35; 36-in. 2.00

Longview, Wash.—Drain tile, per 100 ft.

3-in.	5.00
4-in.	6.00
6-in.	10.00

Tacoma, Wash.—Drain tile, per 100 ft.

3-in.	**4.00**
4-in.	5.00
6-in.	7.50
8-in.	10.00

Chicken Grits

Centerville, Iowa	9.25
Belfast, Me.—(Agstone), per ton, in carloads	10.00
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per ton	10.00
Coatesville, Penn.—(Feldspar), per ton, in bags of 100 lb. each	8.00
Cranberry Creek, N. Y.—Per ton, in carload lots; in bags, 9.00; bulk, 7.50. Less than carload lots, in bags	12.00
Davenport, Iowa — High calcium carbonate limestone, in bags L.C.L., per ton	6.00
El Paso, Texas—(Limestone) per 100-lb. sack	.75
Los Angeles, Calif.—Per ton, including sacks: Gypsum	7.50– 9.50
Middlebury, Vt.—Per ton (a)	10.00
Randville, Mich.—(Marble), bulk	6.00
Seattle, Wash.—(Gypsum), bulk, ton	10.00
Warren, N. H.	8.50– 9.50
Waukesha, Wis.—(Limestone), per ton	8.00
West Stockbridge, Mass.	¶7.50–‖9.00
Wisconsin Points—(Limestone), per ton	15.00

(a) F.o.b. Middlebury, Vt. ¶C.L. ‖L.C.L.

Sand-Lime Brick

Prices given per 1000 brick f.o.b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	10.50
Dayton, Ohio	12.50–13.50
Detroit, Mich. (d)	e13.00–16.00*b
Farmington, Conn.	16.00
Grand Rapids, Mich.*	14.00–15.00
Jackson, Mich.	13.00
Lake Helen, Fla.	8.50– 9.00
Madison, Wis.	12.50a
Mishawaka, Ind.	11.00
Milwaukee, Wis.	13.00*
Minneapolis, Minn.	10.00*
New Brighton, Minn.	10.00
Pontiac, Mich.	13.50
Portage, Wis.	15.00
Rochester, N. Y.	19.75
Saginaw, Mich.	13.50
San Antonio, Texas	12.50
Sebewaing, Mich.	12.50
South St. Paul, Minn.	9.00
Syracuse, N. Y.	18.00–20.00
Toronto, Canada (f)	g12.50–15.00c
Winnipeg, Canada	15.00

Delivered on job. (a) Less 50c disc. per M 10th of month. (b) 5% disc., 10th of month. (c) Delivered in city. (d) Also 15.50. (e) Also 14.00. (f) Also 11.00. (g) F.o.b. yard.

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

City or shipping point		Size 8x8x16
Camden, N. J.		16.50
Chicago District		180.00–210.00a
8x10x16		230.00–260.00a
8x12x16		280.00–330.00a
Columbus, Ohio		13.00b– 15.00†
Forest Park, Ill.		21.00*
Grand Rapids, Mich.		11.00*
Graettinger, Iowa	.18–	.20
Indianapolis, Ind.	.10–	.12a
Los Angeles, Calif.:		
4x8x12		4.50*
4x6x12		3.90*
4x4x12		2.90*

*Price per 100 at plant.
†Rock or panel face.
(a) Face. (b) Plain.

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b nearest shipping point, unless otherwise stated.

Camden and Trenton, N. J.—**8x12, per sq.:**

Red	15.00
Green	18.00

Cicero, Ill.—French and Spanish tile (red, orange, choc., yellow, tan, slate, gray) per sq., 9.50–10.00; green or blue, per sq. 11.50–12.00

Detroit, Mich.—5x8x12, per M 67.50

Houston, Texas—Roofing Tile, per sq. 25.00

Indianapolis, Ind.—9x15-in. .... Per sq

Gray	10.00
Red	11.00
Green	13.00

Cement Building Tile

Camden and Trenton, N. J.:

3x8x16, per 100, 9.00; 3x9x16, per 100	9.00
4x8x16, per 100, 12.00; 4x9x16, per 100	13.00
6x8x16, per 100, 16.50; 6x9x16, per 100	15.50
Chicago District (Haydite):	
4x 8x16, per 100	13.00
8x 8x16, per 100	20.00
8x12x16, per 100	28.00
Columbus, Ohio:	
5x8x12, per 100	6.00
Grand Rapids, Mich.:	
5x8x12, per 100	6.00
Houston, Texas:	
5x8x12 (Lightweight), per M	80.00
Longview, Wash.:	
4x6x12, per 1000	55.00
4x8x12, per 1000	64.00

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

	Common	Face
Camden & Trenton, N. J.	17.00	....
Chicago District "Haydite"	14.00	....
Columbus, Ohio	16.00	17.00
Ensley, Ala. ("Slagtex")	13.00a	
Forest Park, Ill.	....	37.00
Longview, Wash.	16.50	20.00– 40.00
Milwaukee, Wis.	14.00	31.50
Omaha, Neb.	17.00	30.00– 40.00
Philadelphia, Penn.	15.50	....
Portland, Ore.	12.00	22.50– 55.00
Prairie du Chien, Wis.	14.00	22.00– 25.00
Rapid City, S. D.	18.00	30.00– 40.00

(a) Delivered on job; 10.00 f.o.b. plant.

Fullers Earth

Prices per ton in carloads, f.o.b. Florida shipping points.

16– 30 mesh	20.00
30– 60 mesh	22.00
60–100 mesh	18.00
100 mesh and finer	9.00

Note—Bags extra and returnable for full credit.

Stone-Tile Hollow Brick

Prices are net per thousand f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	29.00	42.50	53.00
Brownsville, Tex.	....	53.00	62.50
Brunswick, Me.†	40.00	60.00	80.00
Charlotte, N. C.	35.00	45.00	60.00
De Land, Fla.	30.00	50.00	60.00
Farmingdale, N. Y.	37.50	50.00	60.00
Houston, Tex.	35.00	45.00	60.00
Jackson, Miss.	45.00	55.00	65.00
Klamath Falls, Ore.	65.00	75.00	85.00
Longview, Wash.	....	55.00	64.00
Los Angeles, Calif.	29.00	39.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	50.00	55.00	65.00
Mineola, N. Y.	45.00	50.00	60.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans, La.	35.00	45.00	60.00
Norfolk, Va.	35.00	50.00	65.00
Passaic, N. J.	35.00	50.00	65.00
Patchogue, N. Y.	....	60.00	70.00
Pawtucket, R. I.	35.00	55.00	75.00
Safford, Ariz.	32.50	48.75	65.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% disc.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4 in.	6 in.	8-in.	10 in.	12 in.	15-in.	18 in.	20 in.	22 in.	24 in.	27 in.	30 in.	36 in.	42 in.	48 in.	54 in.	60 in.
Grand Rapids, Mich. (b)	......	......	......	.60	.76	.90	1.20	......	......	1.80	2.10	2.35	3.50	4.00	5.60	6.90	7.85
Houston, Texas	......	.19	.28	.43	.55½	.90	1.30	......	1.70†	2.20	......	......	......	......	......	......	......
Indianapolis, Ind. (a)	......	......	......	.75	.85	.90	1.15	......	......	1.60	......	2.50	......	......	......	......	......
Norfolk, Neb. (b)	......	......	......	.90	1.00	1.13	1.42	......	......	2.11	......	2.75	3.58	......	6.14	......	7.78
Tiskilwa, Ill. (rein.)	......	......	......	.75	.85	.95	1.20	1.60	......	2.00	......	2.75	3.40	......	6.50	......	10.00
Tacoma, Wash.	.15	.18	.22½	.30	.40	.55	.75	......	......	......	......	......	......	......	......	......	......
Wahoo, Neb. (b)	......	......	......	......	.85½	......	1.14	......	......	1.81	......	2.47	3.42	4.13	5.63	6.49	7.31

(a) 24-in. lengths. (b) Reinforced. †21-in. diameter.

Dragline Excavators for Stripping and Sand and Gravel Excavation

By J. C. French
Engineer, Monighan Manufacturing Corp., Chicago, Ill.

ALTHOUGH the dragline excavator is in use throughout the country for sand and gravel pit excavation, a majority of producers probably does not know the machine or its advantages of operation. The excavation of pits has not been given the same amount of thought and consideration the plant and its accessories have, with the result that the plant in many instances has been improved by the installation of every known up-to-date device to insure efficient and lower cost processing, but the excavation or primary production department is handicapped by antiquated methods and machinery.

The seemingly satisfactory results obtained by the old methods have evidently blinded owners to a consideration of newer plans and machinery to improve and increase production in this important department. Opinionated viewpoints of sand and gravel operators have also tended to delay improvements in the pit excavation operation. They have been and are satisfied to leave the pit excavation to the methods of the past and to avoid experimentation that they feel is necessary with new machinery and methods. It is true that the older methods have been improved from a machinery standpoint, but it is not the equipment that is being used that is to blame in many cases, it is the method of obtaining the material.

Most gravel pit owners know the principles of power-shovel operation and the operation of a cableway excavator or a pump dredge unit, but they do not know of the adaptabilities of the dragline excavator to this class of excavation. The excavation of a sand and gravel pit requires a power excavator of wide latitude, flexibility and range of operation, and the revolving dragline machine is one of the best fitted tools for the purpose.

First Dragline Built in 1898

The revolving dragline machine was first built and used about 1898, and in this short period of years it has found adaptability in every field of excavation, and there is no doubt but that it will become more generally adapted for sand and gravel pit excavation after its operation and flexibility of installation is thoroughly understood by the industry. It has been brought up to high efficiency by the demands of the new fields in which it has been installed. New operating schedules and faster cycles have been created and unlimited direction mobility achieved.

Loading cars with revolving dragline machines has always been considered a slow operation when a comparison was made with the results obtained by a power shovel. At the present time, however, the yardages that are being produced in railroad construction work by contractors with dragline machines used for car loading, more than offset the old prejudice and ideas along these lines. Dragline car loading today is a fast and positive operation and a careful study of the average modern dragline machine in a gravel pit will show that all of the old-time traditions regarding this class of machinery, when in its early stages of development, are gone forever.

The revolving dragline machine excavates behind itself or to the side, and the excavation is generally always below the surface of the ground upon which the machine rests. It pulls the bucket towards itself while excavating and swings the load from the point of digging to the point of discharge. Each function coordinates with the other to give a smooth movement that is maintained during operation.

The boom is light and long, being required only to sustain the weight of the excavator bucket and its load plus the side strains of swinging the boom. This allows a fast pickup of the load and insures fast operation. The machine not only digs but is also enabled by its long boom reach to deposit the spoil at so considerable a distance from the digging point that often no other transporting machinery is necessary. The entire machine revolves upon its base and the swing is through 360 deg., or what is termed a full swing.

The dragline bucket can dig harder material than either the clam-shell or orange-peel types and is also more completely under the control of the operator on the machine. The power application to the bucket is of continuous magnitude as the pull is in a straight line from the machine to the bucket practically at all times.

The connection between the digging bucket and the machine is entirely by cable and as cable is a flexible unit, shocks and unusual strains are eased before reacting upon the point of application of power. This places the percentage of maintenance and repair hours on a dragline machine lower than with the use of any other type of excavating machinery. The lower maintenance and repair percentage also means less time

Walking dragline at the Gravel Rapids Gravel Co.

Truck mounted traction dragline, Indianapolis plant, American Aggregates Corp.

lost for replacements and insures greater yardages.

The dragline machine operates as close to the edge of the pit as safety will permit and swings the digging bucket over and into the excavation or pit. The loading action can be started at any point from the bottom of the pit to the top to suit conditions of material, as the bucket position is under definite control by the machine operator at all times.

The bank of the pit becomes a long slope at an approximate angle of 40 deg. to the horizontal. Compare this safety slope with the slopes obtained under other methods of excavation; cave-ins and spring thaw dangers are eliminated as problems for the pit owner.

Under-Water Digging

Digging under water is no task for a dragline machine and accurate results can be obtained during the entire year under flooded pit conditions or otherwise. Deep excavation under water can be reached with the dragline bucket providing the boom length is in proportion to the depth of the cut. The rule for this depth is one-half the length of the boom. This rule insures a smaller machine installation than would be necessary for any other type of equipment.

The removal of sand and gravel involves three separate operations; first, the excavation of the material; second, the conveying of this material to some point for transfer to a receiving plant; third, the transportation of the materials to a point beyond the reach of the boom of the dragline machine and through the medium of an auxiliary system. This system is generally an industrial railway provided with cars and locomotives. The transportation system can be placed on the ground level and the loading of the cars can be arranged either for hopper loading or by direct loading from the bucket of the dragline machine. It is not difficult to spot the dragline bucket for correct and efficient car loading and the boom reach of the machine allows latitude of position for both track units and the machine.

In most cases in sand and gravel pit operation there is an overburden of top soil which has to be removed and the depth and extent of this overburden is a big factor in determining the type of machinery to be used for the purpose. The dragline machine can strip overburden and excavate the sand and gravel as one operation. The overburden can be either moved to one side of the pit the full reach of the boom length of the machine, or it may be thrown back into the excavated pit. This stripping of the overburden will keep the dragline machine in constant operation while waiting for the cars of the transportation system or during other delays that occur.

Moving Mechanism

The dragline machine does most of its efficient digging in the rear as it moves along or to one side, but it can level its own path in front just as efficiently if the ground level is unusually rough, containing steep grades, etc. Movement of the machine is a definite requirement for it is only through movement in a horizontal line that the machine is enabled to assume positions for advantageous excavation. Many traction devices are used on dragline machinery. Some of the types are efficient and others not under present-day requirements. The various types are as follows:

1. Skid and rollers, consisting of movement of the machine by pulling its dragline cable and using the bucket for an anchor. The path is made of planking, mounting wooden rollers upon which the machine rests through skids of wood provided under the structural framing of the machine proper.

2. Truck mounting, consisting of a four-roller truck mounted on each corner of the lower base framing of the machine. These trucks are mounted on rails and the rails in turn are mounted on timbers and mats so as to distribute the weight over a large area to prevent any ground difficulties.

3. Caterpillars, consisting of two or four moving platforms which are designed to allow the machine to move ahead under power. The smaller machines are arranged to operate on ground having consistency to withstand a pressure of 10 lb. per sq. in. The larger machines require matting as the bearing pressure runs higher.

4. Walking device, consisting of a circular base that rests on the ground when the machine is in operation for digging and two pontoons upon which the machine rests when walking. A mechanical arrangement is provided which transfers the load from the base to the pontoons and this action produces a stepping movement in any direction desired. This walking device is adapted to operate on any class of ground condition without the use of mats or timbering, due to the bearing pressure per square inch which will average about 6 lb. By swinging the boom in any required direction, the device allows movement immediately in that direction by contacting the walking device control.

Traction Devices Important

The traction device that is used is very important as the particular situation of the ground conditions in a sand and gravel pit usually present a problem that must be solved by an analysis of the moving and maneuvering unit. The sand will cut out bearings, pins and bushings in a short time and the larger gravel will enter the traction units and tend to form wedges or block traction movements causing breakage under power. Analyses of the different traction mountings follow:

1. The skid and roller mounting for a dragline machine eliminates any upkeep from the cutting action of the sand and generally omits the dangers of the wedging action of the gravel, but it adds man power and delays to the movement that will increase the operating costs. Movement with a skid and roller mounting is a slow process and must be carefully watched to prevent accidents to the rollers and machine. The timbering and matting required are items of expense and upkeep that must be considered.

2. Truck mounting also eliminates maintenance to a great extent from the cutting action of the sand, but it also adds delays and man power that must be considered for efficient movement. The tracks must be laid on ties and timbering provided and the movement is extremely slow to prevent any jumping of the rails by the truck wheels. The direction of movement cannot be changed easily and this handicap is serious for correct results along the edge of a pit.

Caterpillar Mounting Popular

3. Caterpillar mountings are popular for the reason that movement can be made quickly in the different directions under control of the operator on the machine, and the speed of travel is considerably faster than with either the skid and roller type or the truck mounting. The main drawback to the caterpillar mounting is the maintenance. This is due to the cutting action of the sand at the pin joints of the caterpillar pads and the wedging and blocking action of the gravel in the pockets of the pad castings. Unless the caterpillar-mounted machine is continually operated on matting the upkeep may be excessive in sharp sand and gritty gravel.

4. A walking device used to maneuver dragline machinery does not have the difficulty of cutting and wedging in sand and gravel and it is not necessary to provide matting or timbering for safety or correct operation. The flexibility of movement allows the machine to move away from the bank quickly in the case of a cave-in, which is especially valuable in the case of an under-water operation and flowing material. Regardless of the side or weight of the machine upon which this device is mounted the same ground conditions can be negotiated.

Essential Features

The essentials of a dragline machine are the substructure, which consists of an upper and lower frame or platform, the turntable, the drum set and swinging machinery, A-frame, boom and bucket. The power plant can be either Diesel, gasoline or electric. Steam has passed as a power unit on all modern manufactured dragline machines.

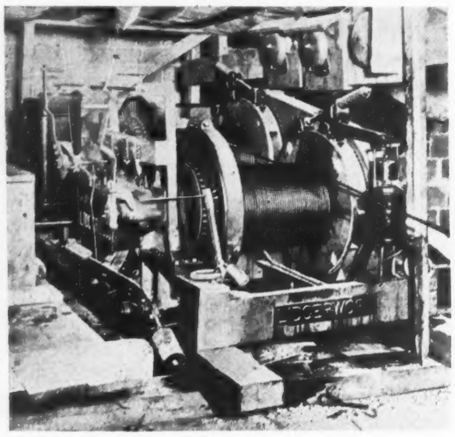
The essential parts, the system of co-ordination and the methods of operation are practically the same in all various makes of dragline excavators. The differences are principally in the details of construction and the methods used in carrying out the principles of operation.

Therefore it is recommended that operators study present excavating units and results; make a careful comparison of these excavators and that of some plant using a dragline of recent type and obtain the facts and figures pertaining to yardages and costs.

New Machinery and Equipment

High-Speed Hoists Equipped with Automatic Brakes

THE Lidgerwood Manufacturing Co., Elizabeth, N. J., has announced a new type of high-speed hoist equipped with emergency brakes which are automatically set in case of either power failure or neglect of the leverman to keep his feet on the service brake levers. This hoist is built in the 100 hp. size, 9000 lb. duty at 300 f.p.m., for operation with 3-phase, 60-cycle alternating current at 220-v. A model is also available for 440-v. operation on special order.



Automatic brakes on high-speed hoist

As in the older hoists, the new type is equipped with band service brakes controlled by foot levers. These are used to govern the rope speed while lowering or to hold the drums while the frictions are disengaged. In addition, however, emergency "V" type post brakes are fitted to each drum over the frictions. These are spring set and released by means of motor-operated hydraulic rams. These emergency brakes will set automatically (1) in the event of failure of power supply, either at its source or by blowing of a fuse; (2) should the leverman fail to keep his feet on the service brake levers, each of which is connected to a switch controlling the emergency brake for the drum concerned.

Furthermore, the emergency brakes may be set at will by means of a hand switch for each drum mounted on a convenient panel, which is also provided with pilot light to indicate whether current is off or on and whether the brake is set or not.

Although the drums are provided with steel ratchets and pawls, the emergency brakes are used in place of these for regular service. The hoist is also provided with an auto-mechanical non-reversing brake which may be manually released by the operator if he desires to reverse the motor and hoist.

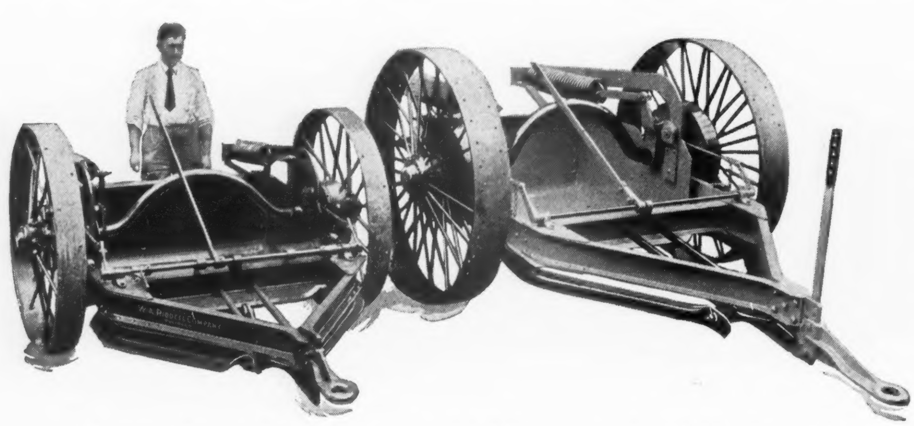
The hoists are shipped from the factory as complete units ready for service except for attaching the current supply wires and fuses and placing rope on the drums.

New 2-Cu. Yd. Wheeled Scoops

THE W. A. Riddell Co., Bucyrus, Ohio, has designed and developed a new 2-cu. yd. wheeled scoop similar to the model "A," 1-cu. yd. scoop. This new scoop is carried by two land wheels 66 in. in dia. and with 10-in. rims. A heavy bowl or pan is supported upon a full length, one-piece, axle, forged from nickel steel. This axle is arched high in the center to afford maximum loading space in the bowl. The wheels are Timken-bearing mounted and each is equipped with clutch housings which contain clutches of the progressive internal expanding band type.

The new scoops, which are of 2-cu. yd. capacity, level full, are operated in the same manner as the smaller 1-cu. yd. scoops.

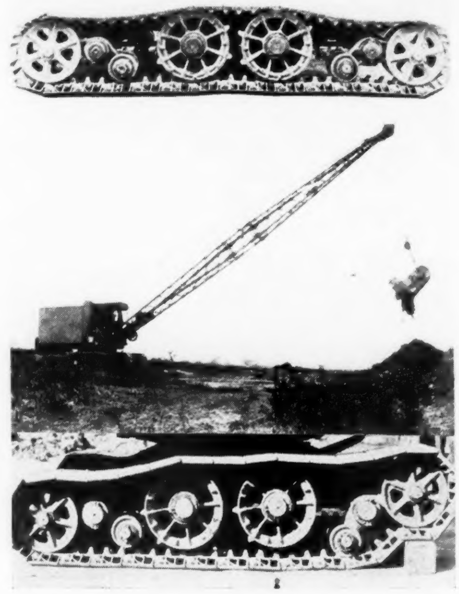
They are operated in trains of two or more, depending entirely upon the tractor's power. The ordinary 10-ton type tractor, it is claimed, will operate three of the model "T" or 2-cu. yd. scoops without difficulty. The operations of the scoop are continuous, as it is not necessary to stop the tractor to either load or dump. When operating in trains, the functions of the various scoops are controlled from a loading platform on the leading scoop through hand lines by one man.



The new 2 cu. yd. wheeled scoop (right) compared with the 1 cu. yd. at the left

Improved Center Drive Crawlers

NEW improved center drive crawlers are announced by the Thew Shovel Co., Lorain, Ohio, for its line of product, the ¾-yd. Lorain-45, 1-yd. Lorain-55 and 1¼-yd. Lorain-75. The new "64" and "68" tread crawlers (the numerical designation of the crawlers comes from the number of treads in the self-laying tracks) are available for the Lorain-45, 55 and 75 cranes, clams, drags and backdiggers.



New center drive crawlers for power shovel

Basically they are the "52" and "56" tread crawlers, with equalizer rocker arms, carrying both a large end roller and a small intermediate load-carrying roller mounted on the end axles. This places the large end rollers in advance of the end axle and increases the overall length from 12% to 29% on the various units. The resulting greater supporting area also is said to give reductions of ground pressures that average from

15% to 25%. The action of the equalizer rocker arm is such that the tendency to "dig-in" is eliminated, it is claimed.

The equalizer rocker arm action in this respect is illustrated by the traveling action of the crawler. The up-and-down action of the equalizer rocker arm (prevented from reversing by an automatic stop) enables the crawler tread to self-adjust itself to the contour of the terrain without "bridging" across depressions, etc., the manufacturers say.

The standard "52" and "56" crawlers are said to be improved throughout. These improvements in general are typified by the new Lorain-75 crawler which is 12% longer, 2300 lb. heavier, has a stronger, improved car-body casting, has 7x7-in. end axles, has 12% increased tractive effort and has steering clutches mounted on splined shafts.

New Three-Ton Truck

THE Relay Model 50-D rated 2-, 2½- and 3-tons is announced by Relay Motors Corp., Lima, Ohio. This model is being built in three wheelbase sizes, 139½-in., 161-in. and 185-in. On the 139½-in. chassis it is claimed particularly adaptable to dump truck operation where short turning radius is required. The six-cylinder engine is rated at 33.75 hp. Lubrication is secured by a forced feed oiling system with connecting rod bearings fed through a drilled passage in the crank shaft from main bearings. Oil is also delivered to the timing gear compartment.

The 50-D transmission has five speeds forward and two in reverse. There are two complete sets of brakes operating independently, service brakes operating on all four wheels, internal expanding hydraulic type. The hand brake is contracting on the propeller shaft.

Standard tire equipment on the 50-D is 36x6-in. pneumatic front. The rear tire sizes will vary as follows, although they are all dual installations: Two-ton rating, 36x6 dual pneumatic; 2½-ton rating, 38x7 dual pneumatic; 3-ton rating, 40x8 dual pneumatic. Oversize tires can be used.

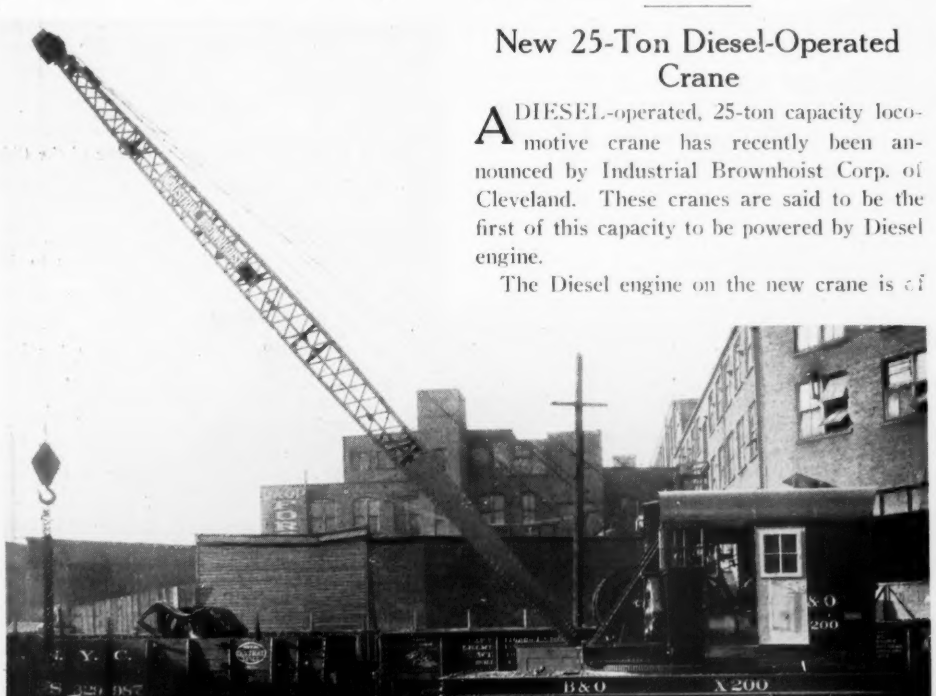
The rear axle is Relay's own design—a pendulum suspension—and for which some decided advantages with Relay trucks are claimed.

New quarry truck has six-cylinder engine and hydraulic brakes

New 25-Ton Diesel-Operated Crane

A DIESEL-operated, 25-ton capacity locomotive crane has recently been announced by Industrial Brownhoist Corp. of Cleveland. These cranes are said to be the first of this capacity to be powered by Diesel engine.

The Diesel engine on the new crane is of the 6-cylinder, 2-cycle, solid injection type and burns any ordinary grade of fuel oil. The entire operating mechanism is mounted on a one-piece, cast steel rotating bed and the side frames are also made of steel castings. The power take-off from the engine is fully enclosed, runs in oil and is equipped with Timken roller bearings to minimize friction and make the crane quiet in operation.



Diesel-driven 25-ton locomotive crane

Small Starter for Throwing Motors Across the Line

A NEW manual starting switch announced by the General Electric Co. is designed particularly to meet the demand for a small device which will throw motors across the line. The switch bears the designation CR-1038-E-1 and has a maximum rating of 1 hp. 110-v. and 2 hp. 220- to 600-v., 3 phase.

The device consists of a tumbler switch and two small thermal cutouts mounted on a common textolite base. By means of suitable interlocks, the switch can be locked in either the open or closed position.

Pneumatic Unloader, Conveyor Device Sold to Fuller Co.

RECENT announcement is made of the purchase by the Fuller Co. of all rights (including patents, designs, patterns and equipment) of the "Airveyor" from the Guarantee Construction Co., New York City. The "Airveyor" has been manufactured and marketed by the Guarantee company for a number of years, and several hundred installations are in use for the unloading of bulk materials, such as lime, soda ash and other pulverized, finely divided, granular and crushed products. The device will complement the Fuller line, which includes the Fuller-Kinyon conveying system.

News of All the Industry

Incorporations

Columbia Cement Co., Brooklyn, N. Y., $50,000. S. J. Kanin, 19 West 44th St., Manhattan.

Stonecraft Co., Grand Rapids, Mich., $10,000. To deal in cement and concrete products.

Trinity Gravel Co., Dallas, Tex., decreasing capital stock from $300,000 to $127,500.

New Jersey Rock Products, Inc., Morristown, N. J., $125,000.

Arkansas-Missouri Gravel Co., Bloomfield, Mo., $30,000. Gilbert C. Hill, Bloomfield, and D. D. Hill, Charleston, Mo.

Beacon Hill Gravel and Sand Co., Inc., Keyport, N. J., 1000 shares common. Edward Farry, Jr., Keyport.

Cadiz Limestone Products Co., German, Ohio, 500 shares no par value. E. S. McNamee, Cadiz, Ohio.

Salem Lime and Stone Co., Salem, Ind., increased capital stock 700 shares, par value $100 each.

Riverside Portland Cement Co., San Francisco, Calif., a $6,500,000 corporation, has filed petition for dissolution.

American Mosaic and Terrazzo Co., Chicago, Ill., increased capital stock from $30,000 to $75,000. Correspondent: Claude J. Dalenberg, 77 W. Washington St., Chicago.

Hillside Washed Sand and Gravel Co., Milwaukee, Wis., increased capital stock from 200 shares to 400 shares, including 100 shares common no par value and 300 preferred at $100 each.

State Washed Sand and Gravel Co., Milwaukee, Wis., $180,000, consisting of 3000 shares Class A common at $10 each, 11,700 shares Class B common at $10 each, and 330 shares preferred at $100 each. T. D. Fraxey, A. Retzloff and E. H. Grootemaat.

Sand and Gravel

Lannon Sand and Stone Co., Menomonee Falls, Wis., is opening up a sand and gravel pit on the Thomas McCarty farm west of its present plant.

Halifax, Nova Scotia. Nova Scotia Shipping Co.'s new barge for carrying sand and gravel will be put into operation shortly. The barge has a capacity of 400 tons.

Amercian Aggregates Corp., Greenville, Ohio, has acquired another building on West Fourth St., Greenville, which will be entirely remodeled for additional office facilities of the company.

Tom Laird, who owns a stone quarry near Bono, Ark., has announced that a gravel pit will soon be opened on acreage adjoining the quarry. More than 100 acres will be developed and it is estimated that a million and a half tons of gravel are available.

Pioneer Sand and Gravel Co., Seattle, Wash., is to have a material warehouse involving an estimated expenditure of between $26,000 and $30,000. The addition, planned by the Austin Co., engineers and builders, is to be located on Lake Union at the foot of Fairview Ave.

C. D. Smith of Los Angeles, who has leased from H. S. Frymire and B. L. Sisson the gravel beds on the Stanislaus river, near Knights Ferry, Calif., is preparing to begin operations at an early date. The dragline and dredging equipment for the plant is being assembled.

Standard Gravel Co., Inc., Camden, Ark., advises that the newspaper report reprinted in November 23, ROCK PRODUCTS, from the Little Rock (Ark.) Gazette to the effect that its dredge operating on the Ouachita river was sunk by a dynamite blast is erroneous, and they are of the opinion that the dredge sank of its own accord.

Laval Sand Co., Hinton, W. Va., has applied for a permit to dredge sand from the Big Sandy river for a distance of about two miles, beginning at a point three miles north of Louisa, Ky., and extending two miles downstream. The company has also requested permit to construct one 8-in. and two 12-in. pipe lines and one 12x14-ft. concrete intake pump house in the Kanawha, a mile above the mouth of the Coal river.

Quarries

Indiana Limestone Co., Bedford, Ind., has received an order for 20 cars of stone to be used in constructing a new federal building at Juneau, Alaska.

Weston and Brooker Co., Columbia, S. C., which acquired the A. T. Small Quarries near Macon, Ga. (see ROCK PRODUCTS, November 23), is reported to be planning improvements in this operation in the near future.

Sol J. V. Godman has obtained permit to establish a rock-crushing plant in Sunland, Calif., near the mouth of Tujunga canyon. Property owners in the vicinity at first demurred because the thoroughfares would be affected by the heavy trucking traffic, but when Mr. Godman agreed to build a railroad spur to the plant, all objections were removed.

Piedmont Quarries, Inc., Winston-Salem, N. C., recently constructed a spur sidetrack from the Southbond's Waughtown line and is now shipping crushed stone to various sections of the state. In addition, the firm is furnishing the crushed rock for a number of construction jobs under way in the city. Business is reported as being quite good of late.

Thomas and Frankenbury's dolomite quarries in Ohio canyon around Soda Point, Colo., which were closed down temporarily on account of the snow, have resumed operations and about 250 tons of rock a day are being taken out and shipped to the steel works at Pueblo. About 1500 tons of dolomite are being shipped from these quarries each week to the Bessemer steel plant of the Colorado Fuel and Iron Co., Pueblo.

Virginia-Tennessee Marble Co. has been organized at Knoxville, Tenn., to operate the property of the Diamond Marble Co., Friendsville, Tenn. The new company is a subsidiary of the Virginia Alberene Corp., which recently took over the properties of the Ross-Republic Marble Co. at South Knoxville. W. B. Lockwood, W. W. Piper and Mitchell Long are the incorporators. It is reported that improvements to the quarries at Friendsville are being planned.

Cleveland Quarries Co., Cleveland, Ohio, has moved its offices from the Union Trust Co. Bldg. to the new Builders Exchange Bldg., Cleveland. More than 10,000 ft. of floor space will be taken over by the company and two subsidiaries, the Ohio Cut Stone Co. and the Lorain & Southern railroad. Offer of a 10-acre tract of land on the western outskirts of Amherst, near Lorain, Ohio, for the erection of a Lorain County tuberculosis sanitarium, was recently made by the company to the sanitarium building commission.

Cement

St. Mary's Cement Co., St. Mary's, Ont., has started work on a plant addition.

Cebu Portland Cement Co., Cebu, Philippine Islands, has ordered two large steam locomotives from the Davenport Locomotive Works, Davenport, Iowa. The contract involves approximately $40,000.

Medusa Portland Cement Co., Cleveland, Ohio, recently held a meeting at its West York, Penn., plant for the purpose of arousing enthusiasm among employes in co-operating with the officials to keep the accident record of the plant perfect. To date this year there have been no lost-time accidents at the plant, and if the company can continue the good record throughout this month they will be awarded a Portland Cement Association trophy. R. L. Landis is superintendent of the plant.

Gypsum

American Gypsum Co.'s employes held their annual booster banquet at Port Clinton, Ohio, recently. Arthur Black, sales manager, was toastmaster.

Cement Products

Lay-More Tile Manufacturing Co., Faison, N. C., will erect another plant at Goldsboro, N. C., and will begin operations here immediately upon its completion. The company has cement products plants located at strategic points in various parts of North Carolina.

Hume Pipe Corp., 100 West Monroe St., Chicago, manufacturers of concrete pipe, is planning a new plant at Arlington Heights, Ill., the main unit of which will be one-story, 75x165 ft., to cost approximately $115,000 with equipment. J. A. Dunn, Evanston, Ill., is vice-president and general manager.

Art Stone and Tile Co., Wilmington, Del., has received contract for 1000 cast stone sills for a new building at the Baldwin Locomotive plant in Eddystone, Penn. The sills are made in two 100-ft. molds. Each will take a double row of sills, making about 120 sills to each mold. After the form is made, the concrete is poured from the new Jaeger non-tilt mixer recently purchased by the company. Molded sills are later removed and ground until a smooth surface appears.

United Concrete Co. expects to have the plant it is planning to erect at Girard Ave. and the Maryland and Pennsylvania railroad, York, Penn., in operation on or before March 1, 1930. A modern ready-mixed concrete plant with a capacity of 600 cu. yd. per day will be erected on the site. The company is reported to be planning a chain of similar operations, of which the York plant is said to be the third. Edwin F. Hively, Jr., is general manager. He is also secretary and general manager of the Peerless Sand Cement Brick Co., from which office he will transact all business preliminary to operation of the new plant.

Agricultural Limestone

Maxwell, Iowa. Maxwell Lime Association, recently organized, has erected a storage shed in the railroad yards as a distribution source for agricultural limestone in the district. Prices quoted are $2.65 per ton at the warehouse or $2.40 per ton at the cars.

Miscellaneous Rock Products

Philadelphia Quartz Co., Philadelphia, Penn., has let contract to the Consolidated Engineering Co., for a plant at Fort Ave. and Decatur St., Locust Point, to manufacture silicate of soda in various forms. William T. Elkinton, 121 S. Third St., Philadelphia, is president of the company.

Personals

Charles P. Clampitt is to take charge of the Chicago office of the Alexander Milburn Co., Baltimore, Md. The Chicago office is located at 220 S. State St.

Joseph Drusbacky of the Port Clinton, Ohio, plant of the United States Gypsum Co., has been promoted to a position which will take him to the company's plant at Fort Dodge, Iowa.

John L. Mason, formerly sanitary engineer for the Water Works Supply Co., San Francisco, Calif., has become sewage research engineer for the Hardinge Co., York, Penn. Mr. Mason has had considerable experience in this field and collaborated in the development of the "Watsco" aerator for the activated sludge treatment of sewage.

J. J. Hartley, formerly in charge of foundry equipment sales of the Link-Belt Co., Chicago, Ill., has been promoted to the position of chief engineer of the company's Pershing Road plant at Chicago, Ill. W. L. Hartley, brother of J. J. Hartley, and formerly assistant in the foundry equipment sales department, has been appointed manager of this department to replace his brother.

R. B. McKinney has been appointed assistant to the general manager of the explosives department of the Hercules Powder Co., Wilmington, Del. Mr. McKinney has been a member of the Hercules organization for 17 years, having been director of purchases since 1918. He will be succeeded as head of the purchasing department by **F. P. H. Sholly**, now assistant director of purchases.

Lockwood Hill, for the last 10 years a member of the Blackman-Hill Co., St. Louis, Mo., has organized a new company known as the Hill Equipment Co., with offices at 4620 Delmar Blvd., St. Louis. The new organization will have the exclusive sale of the products of the Lincoln Electric Co. and the Baker Industrial Truck Co. in the St.

Louis Metropolitan district and the eastern Missouri and southern Illinois territories.

M. J. Gormley, chairman of the Car Service Division, American Railway Association, has also been elected executive vice-president of the same organization. Mr. Gormley has been engaged in the business of transportation during his entire business career, having entered railway service in 1893 on the Chicago and Northwestern at Eagle Grove, Iowa. Since then he has served in various capacities and in 1921 was appointed chairman of the Car Service Division of the American Railway Association.

Manufacturers

E. I. du Pont de Nemours & Co., Wilmington, Del., plans the expenditure of more than $25,000,000 on construction during the next year.

Central Alloy Steel Corp., Massillon, Ohio, is planning a new electric furnace at its Canton works, at an approximate cost of $200,000. New circle cutting equipment will also be installed.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., announces the appointment of T. B. Wood's Sons Co., Chambersburg, Penn., as special distributors for "Texrope" drives as well as "Texrope" belts.

Lewis-Shepard Co., Boston, Mass., has appointed the Lincoln Products Corp., 31 Fulton St., Newark, N. J., as distributors for its jack-lifts, arc-welded platforms and stackers in northern New Jersey.

Blaw-Knox Co., Pittsburgh, Penn., will exhibit its complete line of road-making equipment at the 1930 Road Show at Atlantic City, also the road-making equipment of the A. W. French Co. division of the Blaw-Knox Co.

American Steel and Wire Co., Chicago, Ill., subsidiary of the United States Steel Corp., will build two rod mills and one billet mill at Donora, Penn., the total cost of which is estimated at around $5,000,000.

Wheeling Mold and Foundry Co., Wheeling, W. Va., will exhibit a 9x16, a 9x36 and a 15x38 roller bearing crusher at the 1930 Road Show to be held at Atlantic City in January. These crushers will show many improvements over the models exhibited last year. The exhibition will be in space 414 and will be in charge of Wm. H. Sallwasser.

Lincoln Electric Co., Cleveland, Ohio, has appointed the following new district sales representatives: R. B. Tuhey, district representative at Indianapolis, Ind., with offices at 517 Peoples Bank Bldg., and S. H. Taylor, district representative at Los Angeles, Calif., with headquarters at 812 Mateo St.

Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn., has adopted a new pension plan providing for voluntary co-operation of employes, according to a contract with the Equitable Life Assurance Society. The plan is one of the largest in scope, affecting all of the workers on the company's payroll with one or more years of service.

Young Radiator Co., Racine, Wis., reports plans under way to double its manufacturing possibilities during the coming year. The company advises that production of industrial type internal combustion engine cooling radiators for trucks, power units, compressors and industrial machinery, and its new type forced draft heating units has reached its peak in the history of the company.

Brown Instrument Co., Philadelphia, Penn., is exhibiting its line of pyrometers, thermometers, flow meters, indicating, recording and controlling instruments at the Power Show in New York City, December 2-7. A prominent feature of the exhibit is the line of distant dial (remote type) gages for use where instruments are required to record or indicate pressures and liquid levels from points which may be located at distances of as much as 30 miles.

Headley Emulsified Products Co. on October 1 became the successor to Headley Good Roads Co., Philadelphia, for 21 years manufacturers of emulsified asphalt products. The new company will expand this line to cover all of the following industrial uses: highway construction and maintenance, railroad platforms and crossings, waterproofing, dampproofing and protective coatings for all types of structures. Officers of the new corporation are: President, Edgar S. Ross; vice-president, Parmely W. Herrick; vice-president and treasurer, M. W. Lefever, and secretary, George D. Webster.

Manganese Steel Forge Co., Philadelphia, Penn., announces that the company's Cleveland office, formerly located at 623 Union Trust Bldg., Cleveland, Ohio, has been discontinued. The territory hitherto served by this office will be handled in the future by J. H. McKinley, manager of the Pittsburgh office, 1714 Clark Bldg., Pittsburgh, Penn. P. M. Hobbs has been transferred from Cleveland and in the future will have charge of the company's office at 228 N. La Salle St., Chicago, Ill. W. H. Potter, former manager of the Chicago office, has been made general sales manager and will henceforth make his headquarters at the main office of the company in Philadelphia.

General Refractories Co., Philadelphia, Penn., has recently appointed the Bison Builders Supply Co., 1345 Genesee St., Buffalo, N. Y., as it High Temperature Cement dealer representative in Erie county, New York state. The products of the company handled by this dealer are GREFCO chrome high temperature cement and "Standard" silica bonding cement. Paxson Taggart Co., Luzerne and D Sts., Philadelphia, Penn., has also been appointed dealer representative for these high temperature cements in the Philadelphia district and the surrounding counties of Chester, Montgomery and Bucks. Their territory will also include the southern half of New Jersey, going as far north as Trenton and Princeton.

Trade Literature

Trap Rock. A very interesting broadside outlining advantages of trap rock for road bulding. THE JOHN T. DYER QUARRY CO., Norristown, Penn.

Portland Cement. "Time Means Profits" is the title of an interesting folder outlining advantages of Lone Star cement. INTERNATIONAL CEMENT CORP., New York City.

Detonator Facts. No. 2 of a series of leaflet talks concerning the development, manufacture and use of blasting caps and electric blasting caps. HERCULES POWDER CO., Wilmington, Del.

Locomotives. Gasoline, distillate, storage battery, Diesel, oil-electric, and trolley locomotives are described in a new folder of GEORGE D. WHITCOMB CO., Rochelle, Ill.

Construction Costs. "The Road to Economy in Building" is the title of an attractive booklet telling how construction costs may be controlled through simplification of design. MORTON C. TUTTLE CO., Boston, Mass.

Fire Brick. Folder giving descriptive data, specifications and uses for Laclede fire brick and some testimonials from satisfied users of this refractory material. LACLEDE-CHRISTY CLAY PRODUCTS CO., St. Louis, Mo.

Cranes. No. 2, Volume 2, of Crane Service News for October and November, showing pictorially the many uses to which cranes may be adapted in construction and other fields. CRANE SERVICE ASSOCIATION, Lorain, Ohio.

Shovels, Cranes and Crawlers. Folder outlining the Thew center-drive principle—how it simplifies from a mechanical and maintenance viewpoint and increases profitable performance from an operating angle. THEW SHOVEL CO., Lorain, Ohio.

Chain Grate Stokers. Catalog GND-2 on the Green natural draft chain grate Stoker applicable to boilers of all types where load and operating conditions are such that a natural draft chain grate stoker is suitable. COMBUSTION ENGINEERING CORP., New York City.

Chain Hoists. New catalog giving descriptive data and prices and special advantages of all types of Ford hoists. Many useful tables of hoisting data are included and the catalog is profusely illustrated with photos showing the various hoists in use. FORD CHAIN BLOCK CO., Philadelphia, Penn.

Dust Recovery. Bulletin No. 1A, containing reprint of an article, "Abating Black Smoke Will Not Solve the Problem of Atmospheric Pollution," by R. D. MacLaurin, Ph.D. THE DUST RECOVERING AND CONVEYING CO., Cleveland, Ohio.

Roller Chains. A 96-page book, designated as Roller Chain Data Book No. 1257, describing and illustrating the construction of chains and wheels and showing practical applications of the roller chain on light and heavy duty industrial drives and on all types of machinery, tractors, trucks, etc. LINK-BELT CO., Chicago, Ill.

Welding. A 12-page illustrated pamphlet outlining correct practices for instruction of welding operators to be engaged in airplane manufacture. The second part of the booklet carries a discussion on the welding of Duralumin, an aluminum alloy notable for its qualities of light weight and high strength. LINDE AIR PRODUCTS CO., New York City.

Pumps. Bulletin No. 133 describing types of sand and dredging pumps for use in dredging work, sand and gravel production, hydraulic mining and stripping, and pumping of abrasive mixtures such as slurry in cement mills, etc. Bulletin No. 134, covering medium-duty dredging pumps for total heads not exceeding 100 ft. MORRIS MACHINE WORKS, Baldwinsville, N. Y.

Double Crimped Wire Cloth and Woven Screens. Thirty-six-page booklet giving complete reference data on double crimped wire cloth and woven wire screens, with illustrations showing filter-presses, revolving screens, sifters, vibrating screens, driers, strainers, pulverizers, etc., whose operation is controlled with wire cloth and woven wire screens. LUDLOW-SAYLOR WIRE CO., St. Louis, Mo.

Lubrication and Belting. Volume 2, No. 2 of Houghton's "BLACK and WHITE" magazine, containing such interesting articles as "Pulverized Coal as a Fuel," by Prof. Robert B. Rice, "High Pressures for Industrial Power Plants," by J. B. Crane, and various articles on lubrication and belting. E. F. HOUGHTON AND CO., Philadelphia, Penn.

Crushers and Screens. Folder 29-S covers crushers in a range of sizes for various purposes, including that used for fine crushing in products plants, crusher with elevator attached, limestone pulverizers, and the crusher for use at the rock quarry and in gravel pits where oversize requires a large jaw opening. Folder also describes stone and gravel screens for heavy duty. UNIVERSAL CRUSHER CO., Cedar Rapids, Iowa.

Jacklifts and Stackers. "Jacklift and Stacker Practice" (Engineering Edition No. 57), describing four useful stackers designed for difficult jobs—automatic barrel tipper, crane type, tin plate, and barrel tipping stackers. Bulletin also describes complete line of arc-welded, steel leg skid platforms, corrugated pressed steel skid platforms, and various types of jacklifts. LEWIS SHEPARD CO., Boston, Mass.

Tractors. Bulletin entitled "Traction for Manufacturing" demonstrates with action photographs the place of the tractor in modern factories. "Maneuverability and Non-Slip Traction" emphasizes the importance of pull that does not slip and power that maneuvers with ease in narrow quarters. Booklet entitled "Moving Things" shows how contractors, factories and individuals are profiting by using tractors to move produce, buildings, wreckage, etc. CATERPILLAR TRACTOR CO., San Leandro, Calif.

Meters and Outdoor Apparatus Insulators. Leaflet No. 20433 on detachable watt-hour meters, Type OB, for indoor and outdoor use. Operation and construction discussed, and a table of approximate weights and dimensions of the sizes of meters listed as standard is given. Also a new circular, entitled "Westinghouse Apparatus Insulators," giving information and test data on complete line of outdoor apparatus insulators. WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., East Pittsburgh, Penn.

G-E Bulletins. GEC-81A covering industrial heating devices, such as immersion heaters, strip heaters, cartridge units, etc. GEA-1125, dealing with the G-E arc-welding school at Schenectady and giving useful information on the processes of arc-welding. GEA-874D covering type WD-200A arc welder with belt, motor or gas-engine drive. GEA-875D on type WD-300A arc welder, rating 300 amp. GEA-394A on induction motor-generator sets. 7/8 to 35 kw., 125 or 250 v. GENERAL ELECTRIC CO., Schenectady, N. Y.

Pipe Welding

THE Linde Air Products Co., New York, has issued a booklet, entitled "Design Standards for Oxweld Steel and Wrought Iron Pipe." The book points out how the oxy-acetylene process has revolutionized pipe fabricating practice. In pipe fitting, cast or forged pipe fittings and special bends are eliminated except where flanged or screwed couplings are required to connect to valves, for fittings can be neatly and compactly fabricated from standard sizes of pipe, to develop maximum strength with utmost economy of material, by means of the welding and cutting blowpipes. Oxweld joints, once tested and found tight, remain so without further attention for the life of the pipe itself, the book states.

The use of welding materially simplifies the design. It is unnecessary to consult catalogs of fitting manufacturers in order to determine what standard or special fitting can be used for the required job. Further, no consideration need be given to the exact length of connecting pipes as cutting and welding has made it possible to fabricate easily, on the job, the pipe requirements.

The different methods of welding line joints are discussed with detailed explanations as to the specific application of each type of joint with strength specifications. A list of tables are included that are of value to users of oxy-acetylene welding outfits.